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CULTURAL PERCEPTIONS OF CHIKUNGUNYA IN THE
DOMINICAN REPUBLIC

by

James Preston Kerns

Bachelor of Arts
University of South Carolina, 2014

Submitted in Partial Fulfillment of the Requirements

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Anthropology

College of Arts and Sciences

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2016

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DEDICATION

To my father, Glennis Kerns, for showing me that there is always a path forward, and to my partner, Caitlan LeMatty, for taking every step of that path with me.

ACKNOWLEDGEMENTS

I would like to thank my family, for encouraging me to attend university and pursue graduate school. I also want to recognize the unwavering love and support the LeMatty family has shown me. I am also indebted to my committee: David Simmons, Mark Macaуда, and Sherina Feliciano-Santos. I am especially grateful to David Simmons for helping me discover the Dominican Republic, showing me true hospitality, and offering guidance at every juncture of this journey. The professors and students of the graduate department have also helped me move forward with my work, providing advice, support, and reassurance. Finally, I would like to thank all of the kind Dominicans I met and worked alongside of. Their humor, friendship, and liveliness made this work possible, and helped me better understand their country and vibrant culture.

ABSTRACT

Chikungunya (CHIKV) is a mosquito-borne virus that recently (2013) entered the Western hemisphere and tore through the Caribbean and most of Latin America. The symptoms include rash, joint pain, vomiting, diarrhea, headache, and fever. In many cases, sufferers report persistent arthralgia long after the actual viral infection has subsided. There are a variety of misperceptions about CHIKV, which directly impact public health efforts aimed at reducing the prevalence of the disease. Understanding the epidemic spread of CHIKV in the DR and the growth of misconceptions about the origin, severity, cause, and treatment of the disease requires a perspective that encompasses the historical and socioeconomic as well as the biological. The spread and experience of CHIKV in the DR is also shaped by patterns of public spending, socioeconomic conditions, and the physical environment. Long-term historical processes shape the socioeconomic conditions that are present alongside the disease, especially the relationship the DR has had with the U.S. throughout the 20th century. These historical relations and processes also affect the nature of misperceptions that spring up around CHIKV in the DR. Historical analysis, semi-structured interviews, and surveys were used to document and contextualize cultural perceptions of CHIKV in the DR. Understanding misconceptions about the transmission and nature of the disease can help improve public health efforts that may be hindered by popular misperceptions of the disease.

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control
CHIKV	Chikungunya
DDT	Dichlorodiphenyltrichloroethane
DR	Dominican Republic
DR-CAFTA.....	Dominican Republic-Central America Free Trade Agreement
ECSA	East Central South African
GDP.....	Gross Domestic Product
IFZ.....	Industrial Free Trade Zone
NAFTA	North American Free Trade Agreement
NSAID	Non-Steroidal Anti-Inflammatory Drug
PAHO.....	Pan American Health Organization
PUCMM.....	Pontificia Universidad Católica Madre y Maestra
RIDL	Release of Insects Carrying Dominant Lethal
SES.....	Socioeconomic Status
TNC.....	Transnational Corporations

CHAPTER 1

INTRODUCTION

Chikungunya (CHIKV), a mosquito-borne disease first observed in Africa, has recently emerged in the Western hemisphere, with the first recorded case occurring on the island of St. Martin and reported by the Centers for Disease Control (CDC) in December of 2013. Since then it has spread rapidly throughout the Caribbean, especially affecting the Dominican Republic (DR) where 429,421 cases were reported in the first six months after the disease was initially detected in February 2014 (Pimentel, Skewes-Ramm, & Moya, 2014, p. 336). No vaccine or curative treatment for CHIKV is currently available, though research is underway (Sudeep & Parashar, 2008, p. 447). The DR is a popular tourist destination for many citizens in the United States (U.S.). Effective control of this disease within the Caribbean generally and the DR specifically can improve the quality of life and disease burden for Dominicans and reduce the probability of the disease spreading to and possibly becoming endemic throughout the Southeastern U.S.

The purpose of this thesis is to document and analyze cultural perceptions of CHIKV in the DR within the context of the socioeconomic, political, and historical relations that have shaped the nation's development through time. Surveys and interviews were used to gain a better microlevel and personalistic understanding of perceptions of CHIKV. These surveys and interviews were distributed and conducted in the city of Santiago de los Caballeros, with some being distributed and performed at a public clinic-Juan XXIII-and others being carried out on the campus of one of the

country's top universities—the Pontificia Universidad Catolica Madre y Maestra—this provided an interesting look at differing opinions about CHIKV across socioeconomic lines. This study took place over the summer of 2015, from June to July. The design of the survey and the interview were pulled in part from Setbon, Raude, and Pottratz's (2008) study on social, environmental, and behavioral factors involved with a different epidemic outbreak of CHIKV on the island of La Reunion, a French protectorate located in the Indian Ocean. There, like in the DR, CHIKV appeared suddenly, spread rapidly, and then seemingly disappeared (Setbon et al., 2008).

A broader look at the history of international relations between the DR and the U.S. was also carried out in order to better understand the driving forces that created current socioeconomic and political conditions that contribute to the incidence of not only CHIKV but also mosquito-borne diseases in general. Injecting a layer of historicity to the understanding CHIKV can lay bare the relationships of power embedded in historical interactions between the U.S. and the D.R. that create conditions conducive to the spread of CHIKV and the proliferation of *Ae. aegypti*. A synthesis of perspectives allows for the unique experience of CHIKV to be framed at the level of the individual as well as the larger historical and economic processes that have convened to produce the social context in which such a disease is found (Baer & Singer, 2013; Brown & Barrett, 2010; Joralemon, 2010). While it is indisputable that environmental factors such as rainfall patterns, topography, and the location of waterways contribute to the proliferation of CHIKV in the DR and the Caribbean in general it is also important to take into account sociopolitical factors that create conditions external the biological environment conducive to the spread of CHIKV (Meason & Paterson, 2014, p. 105). The tangled web

of historical, political, and cultural relationships that characterize the Caribbean necessitate historical approaches to any anthropological study that takes place in the region (Trouillot, 1992, p. 34; Mintz, 1985). This approach offers the potential to identify and begin to remedy larger societal factors that determine disease distribution in the contemporary environment. Merely focusing on the immediate ecological factors that form the epidemiology of CHIKV or the symptoms caused by CHIKV obscures the deeper power dynamics and global relations underlying the distribution and individual experience of the disease. These relations have contributed to the creation and maintenance of particular structures in Dominican society that serve to propagate infectious disease in particular patterns, as well as shape cultural perceptions of the disease at the level of the individual (Farmer, 2004). Therefore, it is informative to begin with a brief examination of the relationship of power that has existed between the DR and U.S. throughout the 20th century.

1.1 Social and Political History of the DR and the U.S. in the 20th Century: Asymmetrical Relationships of Power

The asymmetrical relationship of power between the U.S. and the DR from the 20th century onward has had a profound impact on the economy and development of the DR, and in turn the distribution, infectivity, and perception of CHIKV (Pons, 1995, p. 287). Questions about the origin of the disease or the possibility of the virus being intentionally introduced by outside governments were included with this historical relationship in mind. The number of respondents that agreed the virus may have been introduced intentionally reflects the suspicion many Dominicans feel toward the U.S. government because of their past experiences with American intervention. Military

occupations, trade agreements, and cultural influence have all been a part of the complex interactions between the U.S. and the DR in the 20th and 21st century, and play an integral role in explaining why the disease is spreading and how it is being experienced. Critical medical anthropological approaches to disease emphasize the unbounded and interconnected nature of human populations and nations, the historical dimensions of disease, and the role of socioeconomic arrangements in differential suffering from a disease (Inhorn & Brown, 1990, p. 89). The tourism industry, industrial free trade zones, military dictatorships, foreign military occupation, and contemporary economic agreements are all factors that fall under the scope of this type of analysis. The geographic location of the DR is in and of itself a determining factor in the formation of particular strategic relationships with the U.S. It is located in the center of the Caribbean basin, an important economic and military crossroads. For this reason alone the U.S. has a vested interest in maintaining easy access to and security of these waterways (Kryzanek & Wiarda, 1988, p. 152). The U.S. has intervened in Dominican affairs for a variety of reasons, sometimes imposing military occupation and propping up dictators that ruled through force and at other times providing financial support during times of economic turmoil. The effects of these interventions can still be seen in many ways today in the politics of the DR, the primary sources of revenue for the Dominican economy, and the state of the nation's infrastructure. Some of these include a loss of tax revenue due to profit repatriation, a consequent lack of spending on infrastructure, and economic dependency on the U.S.

1.2 The First Invasion: 1916-1924

The first occupation of the DR, lasting from 1916-1924, had its roots in the Receivership of 1905, passed by President Woodrow Wilson to insure the repayment of debts to foreign creditors. At the time, most of the country's debt was owed to European nations, and pursuant to the Monroe Doctrine the U.S. did not wish to see any European military intervention in the Western hemisphere. To that end, the U.S. moved to insure the repayment of these debts. 45% of revenues collected at Dominican ports would be given to the Dominican government to spend on public services, while the rest would be set aside to be distributed as repayment to nations holding debt against the DR, the U.S. being among the largest of these creditors (Rodman, 1964, p. 118). Already, patterns of public spending within the DR were being directly affected by U.S. authorities through the use of military force. One of the conditions of the receivership was that the Dominican government would not further increase its public debt. President Eladio Victoria used some of the revenue intended for repayment to fund military operations against rebels in the Cibao region; as a result, Marines were sent to Dominican collection houses to insure the collection of payments. The number of marines grew, and in 1916 a military government was imposed after provisional president Henriquez y Carvajal refused to disband the National Army in favor of a National Police force and grant the U.S. control of money passing through the Dominican customs houses. This occupation lasted until 1924, and had profound impacts on Dominican security forces, transportation infrastructure, and economics: the sugar industry was taken over by foreign investors who purchased the majority of plantations sugar cane was grown on and massively expanded the amount of land used for sugar production, the population was disarmed,

and the National Police was created with specialized training in counterinsurgency tactics. The entire national highway system was built, previously locally owned industries were consolidated and controlled by only a few families in the face of foreign investment, and the Tariff Act of 1919 was passed (Rodman, 1964; Kryzanek & Wiarda, 1988; Pons, 1995). This tariff act removed duties against imported from the U.S., leading to a deluge of American manufactured consumer goods entering the Dominican market and the suppression of growing industrialization within the DR (Pons, 1995). The downstream effects of this invasion, legislation, infrastructure development, and political and military reorganization were dramatic and long lasting.

The buyout and consolidation of sugar plantations can be illustrated by the rapid expansion of the industry. This expansion was in part due to other foreign events: WWI had caused the sugar beet industry to collapse, and opened a profitable niche in the world market for sugar. In 1893, the DR had roughly 13,710 hectares of land dedicated to sugar production; by 1925, this amount had grown by 12,000%, with 177,797 hectares being used for the production of sugar. The U.S. also owned one half of the mills operating in the country that refined the sugar, and purchased 98% of the sugar exports (Ferguson, 1992, p. 17). These changes shifted the Dominican economy to become more export-focused, with less of the country's land used for the production of food within the country for its citizens. Not only was more land dedicated to the cultivation of sugar, the cane plantations themselves fell under the control of fewer and fewer corporate interests, many of them foreign. A significant amount of the land appropriated for the cultivation of sugar was taken illegitimately from farmers that worked commonly held agricultural lands in the countryside. To put into perspective how rapidly control of land and sugar

cultivation in the DR was concentrated into a few hands, it is estimated that “...out of the 438,182 acres of land owned by the sugar estates in 1924, 326,416 were owned by the five largest mills” (Ayala, 2014, p. 268). This means roughly 74% of the sugar cultivated in the DR over this period of time belonged to only 5 mills. It also cemented a long-standing economic relationship between the U.S. and the DR, a relationship that the U.S. unequally controlled. Even though the U.S. military left the country in 1924, the economic changes wrought during the occupation insured continued dependence of the Dominican economy on U.S. interests. The massive influx of capital as a result of this sugar boom also led to rapid urbanization of many parts of the DR, along with the creation of a class of landless workers. The impact of focusing on the cultivation of sugarcane reaches far beyond the nation’s economy; it fundamentally altered social relations in the DR:

“Where cane flourished, corporations reduced poor but independent landowners to occasionally employed day laborers, transformed self-respecting rural householders into crowded renters in slum like settlements, created a monoculture which destroyed the country’s ability to produce its own foodstuffs and raw materials for industrial processes, and in most cases transferred the land, and the profits which it earned, into foreign hands” (Calder, 1984, p. 91).

This reinforced the dependence of the Dominican economy on the U.S. and commodity markets, and also created a segment of the workforce that even today suffers from poor working conditions and the associated increased risk of infection by pathogens. Though at the time many of the workers on these plantations were Dominican peasants, today Haitian labor migrants work in the same cane fields and suffer from poor working

conditions and overall health (Simmons, 2010). Not only did this process more firmly tie the health of Dominican markets to the value of sugar as an exported commodity, it also necessitated the increased importation of raw materials and food items, commodities that otherwise might have been procured within the country. Those families that managed to gain control of the newly formed sugar plantations also benefitted for generations to come (Calder, 1984). Wealth became concentrated within a few families, while countless others were dispossessed of their land. Some of the seeds of economic and social inequality that marks Dominican society today can be traced back to the U.S. occupation and concomitant expansion of sugar production and export (Ferguson, 1992; Pons, 1995).

Some of the largest impacts of the U.S. invasion and occupation of the DR from 1916-1924 are unrelated to direct military action. Communally-owned lands were seized and consolidated for the production of sugar by large American corporations. This enriched a handful of families and American corporations, and greatly reduced the domestic production of foodstuffs for Dominican consumption (Ayala, 2014, p. 265). This had a twofold effect: social and economic inequality was rapidly intensified, and the same families that had lost their lands were forced to occupy 'slum like settlements' (Calder, 1984). These landless workers, in turn, became dependent on the low wages they earned working on the newly consolidated sugar plantations. A marginalized and disease-vulnerable population was created, one that suffered from both poor working and living conditions. At the same time, the Dominican economy was rendered more vulnerable to fluctuations of the international commodities market and dependent on imports from other nations (Calder, 1984, p. 93). Finally, the general influx of capital into the nation as a function of sugar exports led to increased urbanization. Large urban

populations provide ideal pools of infection for vector-borne pathogens, especially those associated with *Ae. aegypti*, a mosquito primarily found in urban environments (Sudeep & Parashar, 2008). Socioeconomically disadvantaged people that live in these environments are frequently immunocompromised as a result of poor nutrition or co-infection with other pathogens (Inhorn & Brown, 1990, p. 94). The 1916-1924 American intervention caused numerous changes in Dominican society, but the proliferation of sugarcane as an export was one of the largest, with ramifications for Dominicans in the early 20th century and still today.

The construction of the National Highway System also had important impacts on many facets of Dominican society. For the first time in its history the peripheries of the nation were linked to the urban centers. As a result, there was an increase in domestic trade as well as migration from rural to urban areas. These trends were also exacerbated by the consolidation and expansion of the sugar industry in the country. Not only did the National Highway System aid U.S. troops in their movement through different regions of the country, in the future it would also allow for the rapid deployment of the National Police force to any areas of dissent under the reign of Trujillo. It served as a further catalyst for the export of sugar, allowing for the movement of raw cane to processing facilities and ports located in other parts of the country as well (Kryzanek & Wiarda, 1988). This same National Highway System is still in existence today. The ties that it created between the countryside and urban centers in part contributes to the continued pull of Dominican people towards cities and away from rural areas.

The Tariff Act of 1919 had farther-reaching effects on the Dominican economy. The removal of taxes on imported goods from the U.S. flooded Dominican markets with

both American consumer goods and agricultural products. Both of these imports served to stifle further development of an industrial base and also discouraged the domestic production of foodstuffs. Though the U.S. government was supposed to ‘return the favor’ by removing duties on imported Dominican goods brought to the U.S., this never occurred. Therefore, the agreement was not beneficial to the long-term economic development of the DR, and served only to deepen socioeconomic divisions by enriching a relatively small group of plantation owners and traders and significantly disempowering a large numbers of Dominicans who used to produce manufactured goods or food on a smaller scale (Calder, 1984, p. 77). During this time Dominican culture underwent a period of Americanization, including changes in taste in music, sports, language and consumer goods. It was during this period that baseball was introduced to the DR, which has now become an extremely popular national pastime (Wiarda, 1969, p. 37). It also contributed further to the degradation of small businesses in the DR in favor of increased corporatism foreign investment. Small, family-owned businesses could not compete with the tax-free flow of American goods into the country (Torres-Saillant & Hernandez, 1998, p. 29). The effects of the Tariff Act of 1919 extended beyond its immediate impact on the Dominican economy at the beginning of the 20th century; it flooded Dominican markets with cheap manufactured goods, hindering the growth of Dominican industry and encouraging the ‘Americanization’ of Dominican culture. Widespread exposure to American consumer products created a preference among Dominicans for American brands, goods, styles, etc. and in turn incentivized learning English. This cultural diffusion, in turn, strengthened economic ties and rates of migration from the DR to the U.S. and influenced U.S. perceptions of the DR as a vacation destination ‘friendly’ to

American citizens. It is also one example of many pieces of legislation to come that would lower the tax revenue taken in by the Dominican government. Lowered tax revenues decrease money available for public spending on beneficial social programs from healthcare services to mosquito control efforts. While the economic impacts of the first invasion of the DR were significant, one of the most important changes the U.S. invasion wrought was manifested in military rather than economic reform.

The creation of the National Police force under the oversight of the U.S. Marines would have dire consequences for the DR. Under the military occupation that lasted from 1916-1924, the civilian population was disarmed, and U.S. forces fought against guerilla resistance throughout the country, especially in the eastern regions. The disarmament of the population meant that after the military government abdicated, the National Police force had a monopoly on violence. The possession of firearms was viewed as a sign of manhood, and the general Dominican population was impressively well armed: 53,000 firearms and 200,000 rounds of ammunition were confiscated by the U.S. military (Langley, 1985, p. 80). Eventually the rebellious groups were brought under control as well, but only after prolonged fighting and often times cruel counterinsurgency tactics (Federal Research Division, 1989). After the dissolution of the National Army, the National Police was formed with special training in counterinsurgency tactics from the U.S. military. The U.S. also created the Haina Military Academy to expedite the assimilation of Dominican officers into the newly created National Police. This is the academy that Trujillo graduated from in 1921 (Langley, 1985). One of the young up and coming officers in this new National Police force was Raphael Trujillo. Trujillo received training in the national police force, rapidly rising through the ranks; some attribute the

rise of Trujillo to power in 1930 as one of the most profound impacts the U.S. occupation had on the nation (Wiarda, 1968). Trujillo would eventually seize power through force in 1930, and begin a dictatorship unique in the Western hemisphere in regard to the totality of the regime's control, the extent of the cult of personality surrounding Trujillo, and the terrible brutality used to enforce his control over the nation (Wiarda, 1968). Richard A. Johnson, First Secretary of the U.S. embassy in Santo Domingo and Foreign Service Officer for the U.S. filed a report which elegantly describes the dictator's character and impact on the nation: "The methods he employs to milk the public and the public treasury are as thorough as they are numerous and as lucrative as they are immoral. Even foreign policy is perverted to serve his private ends" (Johnson, 2014, p. 309). Under Trujillo political power became tightly centralized, with all governmental processes needing Trujillo's approval in one form or another: "At a time when most other Latin American nations were beginning or rapidly accelerating the modernization process, the Dominican Republic remained in a highly atomized state under the absolute control of one man" (Wiarda, 1969, p. 24). Not only did Trujillo's reign hold back modernization while he was in office, it also led to political instability and dysfunction after his assassination. The creation of the National Police created both the future dictator of the country and the instrument he would use to assert his domination. The political, economic, and social impact of Trujillo's reign would lead to the promulgation of an administrative environment conducive the unchecked spread of infectious disease.

1.3 Trujillo's Impact and the Invasion of 1965

Much has been written of Rafael Trujillo and the impact of his 31-year reign in the DR. The political, economic, and social consequences have been considered at length,

but here I hope to focus more on the consequences of his rule for the future efficacy of governmental ability to monitor, prevent, and actively treat infectious diseases, especially those spread by mosquitoes. One of the first things Trujillo did that would have ripple effects throughout Dominican politics for decades to come was to consolidate all power and political legitimacy in a single party, the Dominican Party (Wiarda, 1969, p. 31). He controlled the three major sources of power in the nation during his rule: the Catholic Church, the military, and the business-owning elite. As long as they were content, his power was secure. During this period Trujillo also accumulated an astounding amount of wealth, with much of its redistribution going directly to cronies in the government and military in order to insure their loyalty. In this way, not only was the political system entirely overhauled and centered on his authority, the economy itself became an extension of his personal control of the country (Kantor, 1969, p. 7; Kryzanek & Wiarda, 1988). Trujillo's discretion formed the basis for any flow of capital within the country. Still, even during Trujillo's reign, the continued political legitimacy of any ruling entity in the country hinged on American approval. Trujillo managed (for a time) to secure this approval in two ways: through the continued export of sugar to the U.S. during WWII and his assurance that he would resist any Communist influence in the DR. During this period, the DR exported more than one million tons of sugar annually to the U.S., and purchased over 6 million dollars worth of military hardware from the U.S. This hardware, in turn, was used to further solidify his control of the country through the military. Anyone who expressed dissent was kidnapped, tortured, or murdered. This suppressed the growth of any independent political parties centered on interests other than Trujillo's. The exports of sugar insured that the wealthy plantation-owning

members of the government continued to see profits on their exports to U.S. markets (Kryzanek & Wiarda, 1988; Ferguson, 1992).

The consequences of Trujillo's control of the DR for three decades became more immediately apparent after his assassination. The power vacuum that his death created cannot be understated, with political interests that had been stifled for years all yearning to seize control of the government, as well as an extremely well-armed and proportionally large military. Due to its powerful and entrenched nature, the desires of military officers would be the deciding factor in who would lead the nation after Trujillo. Open elections were held in 1962 and Juan Bosch of the PRD was elected. Bosch, however, proved to be too progressive for more traditional elements of Dominican society, both within the upper classes and the ranks of the military. Bosch was deposed, and a triumvirate was installed in the executive office (Gleijeses, 1978). A counter-coup eventually broke out, with citizens and some elements of the military calling for Bosch to be returned to power. General Wessin y Wessin, a conservative military officer, did not support Bosch's policies or enjoy the idea of his returning to the presidency. As a result, tensions began to build between 'constitutionalists' (supporters of Bosch) and 'loyalists' (those arrayed with Wessin y Wessin, and the candidate he supported, Joaquin Balaguer). Balaguer was a long time protégé of Trujillo, and did not make the elites or military officers as nervous as Bosch did. His staunch opposition of Communism also engendered support for the loyalists among members of the U.S. government. Though the constitutionalists eventually gained the upper hand in the fighting, General Wessin y Wessin contacted the U.S. and claimed the nation was about to fall to Communist forces. Framing the conflict as one between communists and anti-communists, the loyalists managed to get the U.S.

military involved, with 42,000 Marines being deployed to the country. After resistance from constitutionalist forces was crushed, new elections were held under U.S. occupation. Joaquin Balaguer was elected, with members of the PRD being terrorized by more conservative elements of the military and government throughout the voting process. Even though Balaguer held the title of president, the real power in the Dominican government rested in the hands of U.S. advisers. After such a large military intervention, the U.S. moved to insure the DR would be a shining example of the successes of 'democracy' and capitalism. To this end, the U.S. government set into motion policy decisions that would create, for a short while at least, the 'Dominican Miracle' (Cambeira, 1997, p. 195).

1.4 Ties that Bind: Balaguer and Further Entanglement

The U.S. government provided Balaguer's government with tremendous amounts of capital, intended to help 'modernize' the country. While there was significant spending directed toward the improvement of infrastructure throughout the country during this time, there was also a concomitant growth in American corporate interests in the nation as well as a significant amount of terror and suppression directed toward the remnants of the political Left. The turmoil caused by revolt and struggle for the presidency had severely damaged the nation's economy and ability to collect tax revenues. Balaguer made it a point to insure continued foreign investment in the country, often through agreements that allowed for incredibly low lease and tax rates for extractive industries in the country. This period also saw the nascent development of what would later become one of the DR's most profitable economic sectors: the tourism industry. At the same time, corruption continued to grow wildly under Balaguer, with

public contracts being awarded to his allies within the military in an effort to consolidate his control and countless political assassinations taking place under a paramilitary death squad called la Banda (Pons, 1995, p. 403; Ferguson, 1992). Even though the economy did grow rapidly in the 1970s, its expansion was predicated on the continued influx of foreign investment. Balaguer insured this foreign investment would continue, even if it meant the loss of workers' rights for average Dominicans:

“For example...one of Balaguer's first acts...was to entice the United States multinational giant Gulf & Western to construct an expansive Dominican empire of sugar interests, beef export, and luxury tourism. At the same time, though, Gulf & Western deliberately maintained a low wage scale for its cane cutters and other sugar industry workers by swiftly smashing the central union located in the company town of La Romana” (Cambeira, 1997, p. 196).

Even though the GDP of the DR rapidly grew during this time period, to a significant extent, this growth was predicated on short-term rather than long-term economic planning. Tax incentives, as a means of bringing in outside corporations would mean millions of lost tax revenue over the years, and a consequent dearth of public spending. As dependence on foreign investment grew, domestic businesses suffered. Growth was achieved, but it was not sustainable. Jobs were created, but they were not very high paying. Business came to the DR, but it did so with generous kickbacks from the Dominican government. Again, a U.S. military intervention on the island produced lasting economic, political, and social impacts that would reverberate into the future. The U.S. propping up Balaguer, and the subsequent wave of terror that occurred under his rule disillusioned many Dominicans about their government having their best interests in

mind. It also demonstrated the naked power exerted by the U.S. government on Dominican politics: a host of other leaders were considered as potential leaders for the nation but who were eventually discarded (Langley, 1985, p. 259). The retention of a politician from the Trujillo regime also insured political cronyism would continue, along with wasteful public spending and nepotism. Access to Dominican markets was capitalized on by American multinationals, and yet again, the ties of dependency between the U.S. and the DR were reinforced. The historical entanglement between the U.S. and the DR in the 20th century explains a great deal of the driving forces behind contemporary socioeconomic conditions in the country, as well as modern patterns of public spending, migration, and economic development.

The U.S. maintained a complex relationship with the DR throughout the 20th century, from a military invasion in 1916 to insure the timely payment of debt and non-intervention of European nations in the Western hemisphere to yet another military intervention to end a civil war and also install a leader that was undoubtedly anti-communist but also ruthless in regard to human rights and political dissidents. One theme runs throughout relations between the U.S. and the DR however: dependence on the whims of the U.S. economy and businesses. Many contemporary socioeconomic factors that directly affect the spread of CHIKV were born of this power dynamic. Tourism, Industrial Free Zones (IFZs), and a lack of public spending on both infrastructure and public health agencies are all indirect results of the patterns of historical relations between the DR and the U.S. leading up to the present day. Historical processes created political, social, and economic structures that serve to allow for and propagate human suffering from mosquito-borne diseases like CHIKV. The economic,

political, social, and cultural ties built up between the U.S. and the DR over the course of the 20th century also increases the likelihood of novel infectious diseases that take hold in the DR will spread to the U.S. The experience of a disease is not just the sum of its symptoms. The chances a disease will impact a region are the result of more than simply the presence of particular vectors or climate conditions. Socioeconomic conditions and political policy directly influence the spread of pathogens, and historical processes give rise to these conditions and structures. Now that the historical relations between the U.S. and the DR have been briefly outlined, the synergistic interaction of socioeconomic conditions and structures and environment and pathogen can be reviewed.

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Framework

Nations, populations, and the diseases they suffer from are unbounded and interconnected, and continue to become more deeply intertwined as globalization accelerates. Disease possesses definite historical dimensions, and socioeconomic arrangements directly affect where, who, and for a how long a population suffers from a disease (Inhorn & Brown 1990, p. 89). This differential is seen both between nations and regions and within societies. Morbidity and mortality can often be tracked along lines of social and economic inequality, and understanding the critical role that these forces play in epidemiology is key to preventing, containing, and effectively treating diseases. The presence, distribution, and experience of CHIKV in the DR are also subject to the influence of these forces. The historical relations of power between the U.S. and the D.R. throughout the 20th century have had an important but not immediately apparent impact on the prevalence of CHIKV in the country, as well as the possibility of it spreading to the U.S. For instance, many policies enacted as a result of direct military and political action on the part of the U.S. in the country are designed to reduce the taxation on foreign multinationals that operate within the D.R. as well as remove duties on the import of manufactured U.S. goods. A loss of tax revenue decreases the funds available to the Dominican government to use for health and infrastructure spending. At the same time, public spending and government employment is being cut by the Dominican government

as a result of neoliberal economic reforms being pushed forward by the U.S. (along with other developed nations). Cuts in public sector spending and employment have negative effects on the health of Dominicans not only in the immediate context of the CHIKV epidemic but also in the future when other mosquito-borne diseases enter nation. Focusing only on the proximate causes of the disease—being bitten by a mosquito that is carrying the virus—obscures the multidimensional nature of the phenomena that Dominicans experienced and continue to experience: “...many thus make a distinction between a host of phenomena directly related to human actions—from improved laboratory techniques and scientific discovery to economic ‘development, global warming and failures of public health—and another set of phenomena, much less common and related to changes in the microbes themselves” (Farmer, 1996, p. 260). To effectively address the problem of CHIKV and other mosquito-borne diseases like dengue in the DR a critical approach must be taken that simultaneously analyses the microsocial understandings of the disease and the macrosocial and economic forces that shape its spread (Farmer, 1996). In this study, surveys and personal interviews capture a part of microsocial understandings and experiences of CHIKV, while a historical approach broadly outlines the forces and international relationships that forged current socioeconomic and political conditions.

The presence of large water containers near many households is a definite contributing factor to the epidemic spread of CHIKV in the DR, but it is important to ask why Dominicans find it necessary to keep these containers. A lack of public spending and preventative public health measures is also another factor that undoubtedly plays a significant role in the spread of CHIKV, but the reason for these patterns of spending and

lack of tax revenue must also be considered. The toll that a disease takes on a population is tied to countless factors, from microscopic mutations in the protein envelope of the pathogen to transnational economic agreements. In order to fully understand the driving forces behind epidemics like CHIKV social, economic, and political arrangements must be analyzed and framed historically. Without this contextualization, researchers may focus disproportionately on the more immediate causes of the disease, attempting to alleviate the apparent ‘symptoms’ rather than the root causes of the problem. This perspective is useful for understanding not only CHIKV, but also many other emerging and re-emerging pathogens that characterize what has been termed the ‘third epidemiologic transition’, an era in which the emergence and spread of disease is closely tied to evolving international relations and economic policies that are crafted in the context of ever-accelerating globalization (Barrett, Kuzawa, McDade, & Armelagos, 1998, p. 247). CHIKV is only one of a number of emerging and re-emerging infections that will become more prevalent and affect populations not accustomed to dealing with infectious diseases in the 21st century. Just as travel, information, and commerce are facilitated through the acceleration of globalization, so too is the prevalence of infectious disease. Relationships of power often become exceedingly apparent in times of widespread disease, and are strategically transformed or reinforced as a result of the disease’s impact on a population (Ortner, 2006). These relations can become apparent in a number of ways. Who is most commonly blamed for the disease? Where is the disease thought to originate? How severe is it perceived to be? These questions and their answers not only directly influence the effectiveness of public health programs and individual preventative measures, but also point to pre-existing social and political

relations that individuals draw on to make sense of new forces in their society. These webs of relations are strung both within and between societies. Understanding power in this way further illustrates the importance of examining both the micro and macro factors that constitute the experience and phenomenon of illness. Within a society, in many cases, the disease will disproportionately affect those marginalized before the appearance of the epidemic. There is also a tendency to lay blame on marginalized social groups for the appearance of the disease in the first place, or a lack of urgency because the affected population is thought to be ‘deserving’ of the affliction (Briggs & Mantini-Briggs, 2003). This has been seen countless times throughout history: cholera, TB, HIV/AIDS, and leprosy are just a few examples of diseases becoming imbued with moral and social implications. These mechanisms of blame, indifference, and misunderstanding frequently lead to tragic shortcomings in disease prevention efforts (Sherman, 2006). Disease and illness are very much a part of human society and experience, and treating them as strictly biological phenomena divorced from social, economic, cultural and political contexts leads to shortcomings in both public health and individual protection. This applies not only to internal social arrangements, but also to international relations between different countries.

For example, during an outbreak of cholera in Venezuela the indigenous population was cast as the embodiment of pre-modernity and filth, natural victims of a diarrheal illness. In addition to this stereotype, the government also manipulated media coverage of the disease, blaming its appearance in Venezuela on neighboring countries that were also suffering from the disease. Rather than directly address the public health threat cholera was posing, some government officials used its presence and the fear it

caused to solidify their power rather than protect marginalized groups from the ravages of the disease (Briggs & Mantini-Briggs, 2003). Additionally, the narrative that cholera was a pre-modern disease generated from filth and ignorance became so powerful that many middle-class Venezuelans in urban centers fell victim to infection as a result of not practicing appropriate methods of personal protection like hand-washing and boiling water. Thus, even when the measures to prevent infection are at hand, social and political forces can alter non-marginalized individuals' perceptions of a disease and their risk of exposure to such an extent that they too suffer and die from it, further propagating the epidemic (Briggs & Mantini-Briggs, 2003) and leading to unnecessary suffering and death. New diseases can often be tracked along the 'fault lines' of social inequality, afflicting the most marginalized and disempowered social groups first and most severely (Farmer, 1999).

The application of this approach to CHIKV in the DR would delve into the role of politico-economic factors: globalization and neoliberalism, the development of IFZs, the tourism industry, patterns of public spending, and bureaucratic fragmentation and political clientelism. Globalization is a process that has been central to the spread of countless pathogens throughout human history, and it has played a special role in the transmission and experience of CHIKV in the DR, alongside other features of Dominican society. Previous and current distributions of CHIKV demonstrate the powerful role of this factor in the transmission of this disease to the DR and the Western hemisphere as a whole. Morens and Fauci (2014) stated that it is suspected that there has already been an outbreak of CHIKV in the Caribbean in the 1820s. This suspected outbreak is also associated with globalization, in that it was recorded by and associated with the presence

of European explorers in the region. Of course, it is difficult to accurately diagnosis whether or not the historical account of the outbreak is describing CHIKV or dengue, given the similarity of the symptoms (Morens & Fauci, 2014, p. 886). Regardless, the Caribbean has frequently found itself at the intersection of interactions between Europe and the rest of the Western hemisphere, often to its general detriment. The explosion of the disease in the Western hemisphere after more than half a century of being restricted primarily to Asia, India, and Africa illustrates the powerful and transformative nature of international commerce, tourism, and transportation that are hallmarks of globalization (Requena-Mendez et al., 2014, p. 4). Globalization is only one process that should be examined in taking a critical medical anthropological perspective on the phenomenon of CHIKV in the DR. The role of many other processes and social and economic arrangements should also be examined. The biological nature of the pathogen, its vector, environment, symptoms, and treatment should also be discussed in combination with a consideration of the socioeconomic context that influences its spread and severity.

2.2 Pathogen, Environment, Vector, and Treatment

The causes, symptoms, treatments, vectors, modes of transmission, reservoirs, and prevention of CHIKV are important to understand when attempting to study the experience of the disease in a particular cultural setting. There are currently no vaccines or curative medications that can be utilized in treatment of CHIKV, besides medications that help in reducing the severity of the symptoms (PAHO & CDC, 2011, p. 33). As a result, prevention of the disease through control of vector populations is the most effective means of decreasing the prevalence of infections (Weaver, 2014, p. 2). The different genotypes, morbidity, mortality, vector distribution, and means of treatment for

the disease are discussed below. Brief descriptions of other epidemic outbreaks of CHIKV are also provided to help provide context when considering the manifestation of the disease in the DR

2.3 Genotypes

There are three different genotypes or strains of the virus that have been identified: the East Central South African (ECSA), Asian, and West African. Until as recently as 2006, each strain was endemic in the regions it was named after (Sudeep & Parashar, 2008). The 2006 outbreak of CHIKV that occurred on the island of La Reunion in the Indian Ocean has been studied extensively, and was surprisingly caused by the ECSA strain of the virus, rather than the Asian strain most frequently associated with that region. At the time it was the largest formally recorded outbreak of the disease (Setbon et al., 2008). Up until this outbreak, the virus was relatively ineffective at infecting *Ae. albopictus*, the more hardy mosquito vector associated with both urban and rural environments. Mutations in the protein envelope of the virus during this outbreak allowed it to more effectively infect *Ae. albopictus*. The strain that has spread in the Americas is of the Asian lineage. This strain was also thought ineffective at infecting *Ae. albopictus*. (Leparc-Goffart, Nougairede, Cassadou, Prat, & Lamballerie, 2014, p. 514). The more capable CHIKV is at infecting different species of mosquitos that thrive in different environments, the more rapidly the disease will spread (Michault & Staikowsky, 2009, p. 489). *Ae. albopictus* is widely distributed throughout the Americas, including the coasts of the U.S. (Nasci, 2014, p. 1395; Chaves et al., 2012, p. 529). Other mutations could occur that might change any number of traits of the virus: infectivity, virulence, symptoms, etc. (Maron, 2014). The longer an arthropod-borne virus is

maintained in a particular species, the more effective it becomes at replicating within it and being transmitted to-in this case-human hosts (Powell & Tabachnick, 2013, p. 15).

2.4 Infectivity

An individual contracts CHIKV (an alphavirus of the family Togaviridae) when a mosquito (of either species *Ae. aegypti* or *Ae. albopictus*) bites them, after having taken a blood meal from another person actively infected with the virus. Unlike dengue fever, CHIKV has an impressive 100% infectivity rate. This means that if a mosquito has a blood meal from an individual infected with CHIKV in their stomach when they bite another person, it is guaranteed the virus will in turn infect the next individual to be bitten. This high infectivity rate explains in part the manner in which the disease seems to explode through populations, moving much faster than other pathogens that also rely on the same vector for transmission (Meason & Paterson, 2014, p. 106). This aspect of the virus contributes to the generation of misconceptions about its transmission. It is estimated that for each individual infected with CHIKV in the Caribbean, 2 to 4 more people will become infected as a result (Cauchemez et al., 2014, p. 1). High rates of infectivity combined with a lack of vaccines or curative medication mean that prevention is the best method of control when attempting to lower the incidence of this disease. Due to the fact that *Ae. albopictus* and *Ae. aegypti* bite throughout the day and night, the most effective means of preventing infection is through the destruction of breeding sites (Meason & Paterson, 2014, p. 107). CHIKV was first reported in Africa, near the border of Tanzania and Mozambique, and was associated both with periods of unusual precipitation (leading to the creation of puddles favorable for the reproduction of vectors) and also periods of drought, when individuals would maintain sources of drinking water

near their home that also served as ideal breeding grounds (Sudeep & Parashar, 2008; Michault & Staikowsky, 2009). While CHIKV has likely been infecting human populations within Africa and Southeast Asia for a significant span of time, it was only formally identified in 1952. One of the reasons for this delay in identification is the similarity of symptoms it shares with other mosquito-borne diseases in the environments in which it circulates, especially dengue and other febrile diseases (Setbon et al., 2008, 492).

2.5 Symptoms, Morbidity, and Mortality

CHIKV has a particular set of symptoms: it begins with a high fever that lasts 2-4 days, rash, nausea, and most significantly for large-scale outbreaks, it is often associated with extremely painful arthralgia that can often times persist for months or years after the cessation of other symptoms. It can also cause headache, muscle pain, and in some cases inflammation of the eye (Anderson, Pureza, & Walker, 2014; Cauchemez et al., 2014; Roques & Gras, 2011). The arthritis usually presents in the small joints of the hands and feet, but can affect other areas of the body as well (Sudeep & Parashar, 2008; Anderson et al., 2014). This arthralgia is often debilitating, preventing infected individuals from being able to carry out day-to-day tasks or perform routine labor. The name ‘chikungunya’ comes from the Makonde term for ‘that which bends’, describing the stature of those affected by the arthritis the virus causes (PAHO & CDC, 2011). This is compounded by the fact that CHIKV has often been found to disproportionately affect those of lower socioeconomic status and those who do not have ready access to healthcare providers (Setbon et al., 2008; Meason & Paterson, 2014). In some cases, usually in older individuals or those that already have a history of arthritic disease,

symptoms of arthralgia can persist for several months or years, significantly affecting mobility and productivity (Borgherini et al., 2008, p. 469). This same pattern applies to many other infectious diseases as well, and allows for pre-emptive focus on those segments of the population most likely to be affected (Inhorn & Brown, 1990; Barrett et al., 1998). While CHIKV is not usually fatal (mortality rate of 1/1000 in La Reunion), work by Manimuda, Mavalankar, Bandyopadhyay, and Sugunan (2010) in the city of Port Blair, India which experienced an outbreak of CHIKV in 2006 suggests the virus does contribute to increased rates of mortality in those populations it affects. Tracking expected mortality rates from 2002 to 2008, the researchers found that although 734 deaths were expected in 2006, 812 deaths were actually observed; this means there was an excess of 78 deaths. This translates to a mortality rate of about 1/1000, similar to reports of mortality from La Reunion (Manimuda et al., 2010, p. 1411). As increasingly larger populations are exposed to the virus, the expected mortality numbers will increase.

This trend to an extent also explains the beliefs held about CHIKV by many of the Dominicans I spoke with and interviewed throughout the course of my research. For instance, given the fact that many individuals noticed that those who have poor living conditions or poor health to begin with are more likely to contract the disease and suffer more severely from it, some also assumed that if an individual had enough money they could buy a 'cure' for the virus that eliminate the pathogen from their bodies and alleviate all of their symptoms. This is not the case. Complications from CHIKV are relatively unusual, but when they do occur they can be exceptionally dangerous. These include thrombocytopenia (deficiency of platelets in the blood), vertical transmission from mother to infant, hemorrhagic fever, Guillain Barre Syndrome (progressive

paralysis of the entire body), inflammation of the eye, muscle failure due to calcium deficiency, hearing loss, and death (Sudeep & Parashar, 2008; Borgherini et al., 2008). The elderly, infants, and individuals with diabetes are more likely to contract and suffer more seriously from these complications. Both dengue and CHIKV are transmitted by *Ae. albopictus* and *Ae. aegypti*, and the co-occurrence of dengue and CHIKV have manifested as hemorrhagic fever in some patients. Other complications include a shock syndrome that results in death (Sudeep & Parashar, 2008, p. 446; Manimuda et al., 2010). An additional unforeseen consequence of CHIKV is the viruses' ability to lay dormant in transplanted tissues, specifically, corneas. Cornea donors on the island of La Reunion, many of whom died from causes unrelated to CHIKV and did not test positive for the virus were contaminated. The ability to lie dormant in corneal tissue means it is advisable to cease cornea donations in areas affected by the disease where careful screening is not carried out. The disease can circulate throughout the entire body system after being introduced through the eye (Couderc et al., 2012, p. 858; Long & Heise, 2012).

Mutations have already occurred in the protein envelope of the Asian genotype that allow it to more readily infect *Ae. albopictus* and in turn potentially impact much larger segments of the population. Future mutations could lead to more serious symptoms, or access to new vectors (Roques & Gras, 2011). A concerning pattern in the literature is the occurrence of 'new' symptoms that are more severe, first noted in outbreaks on La Reunion and in the Kerala state of India. It would appear larger epidemics produce an increased frequency of more severe and up until recently undocumented symptoms. The risk this pattern poses for large, unexposed populations in

Southern Europe and the U.S. should not be ignored (Roques & Gras, 2011; Hanania-Freeman, 2014).

2.6 Treatment

There is no vaccine or curative treatment for CHIKV. Treatment is aimed at reducing the discomfort caused by the disease, especially the joint pain and fever. Nonsteroidal anti-inflammatory drugs (NSAIDS) like acetaminophen or ibuprofen are usually given to patients to help reduce body pains and lower the fever (Sudeep & Parashar, 2008). Availability of these painkillers is also subject to economic forces—at the height of the epidemic, they were hard to find as some people began stockpiling them. Medical professionals also advise patients to rest and drink fluids to stay hydrated. It is interesting to note, however, that a majority of Dominican survey respondents, when asked whether or not there is a cure for chikungunya, responded in the affirmative. In the same way that most respondents assumed individuals of lower socioeconomic status were more at risk for contracting the disease and suffering from more severe cases of it, they also believed that if an individual had the resources, they would also have access to a cure. This is not the case, as there is no approved cure for CHIKV. However, it is true that individuals with lower socioeconomic status and levels of educational attainment are more likely to contract this disease (Setbon et al., 2008). One of the reasons for this is the environment that individuals of lower socioeconomic status live in: people tend to hold onto items that others might consider garbage, like broken household appliances or used tires. These materials serve as breeding sites for both *Ae. aegypti* and *Ae. albopictus* and are usually found in close proximity to one's living quarters. Although various vaccines have been developed, none have been approved for widespread distribution.

Work continues on the development of a vaccine, as it is one of the most promising methods to reduce both the morbidity and mortality of the disease (Michault & Staikowsky, 2009, p. 490). It is likely that if CHIKV were to emerge and spread rapidly throughout the U.S. or Southern Europe development of a vaccine would be accelerated. Again, this is a reflection of the impact that historical relations and contemporary economic conditions have on the distribution of disease. Dengue, malaria, and yellow fever used to be widespread throughout the U.S., but have been eliminated for more than half a century (Gubler et al., 2001). The same vectors that spread these diseases are also competent vectors for CHIKV. For the most part, Americans and Europeans are unaccustomed to suffering from mosquito-borne diseases, and demand immediate action on the part of the government when these diseases emerge (such as West Nile virus). Unless a vaccine is developed, the primary measures that can be used to reduce the incidence of CHIKV (in both the U.S. and the DR) are surveillance of newly reported cases and destruction of potential mosquito breeding sites (Arya & Agarwal, 2011). As a result, it is important to examine the different methods of prevention available in the U.S. and the DR

2.7 Prevention

Several methods exist for the prevention of mosquito bites in the U.S. and the DR. Insect repellants, destruction of breeding sites, mosquito nets, widespread spraying of insecticides on the part of the government, bite-resistant clothing, the introduction of biological controls to breeding sites, properly screened windows, and the sterile insect technique are all possible options for the reduction of mosquito populations, and in turn, the incidence of mosquito borne diseases. While measures like insect repellant and bite-

resistant clothing do help in reducing the risk of being bitten, the elimination of breeding reservoirs is one of the most effective means of reducing mosquito populations. On La Reunion, the use of insect repellent and insect repellent devices (like electrical coils) did not serve to significantly decrease the chance of an individual or household member contracting the disease (Staikowsky et al., 2008). Pending the development of a widely distributed vaccine, this ineffectiveness again reinforces the need for the avoidance of mosquito bites as a primary means of disease prevention, mostly through the destruction of breeding sites and mosquitos. Community education programs about eliminating potential breeding sites have been pursued in the past in an effort to combat other mosquito-borne diseases like Dengue and have proven effective in some instances (Gordon, Rojas, & Tidwell, 1990, p. 195). Countermeasures include the elimination of features of the urban environment that are conducive to the reproduction of mosquitos: properly drained gutters, reliable provision of clean drinking water that would remove the need for large water storage containers in individual households, and regular collection of garbage and other debris that can create pools of standing water. In those cases where water containers will be present, properly covering them or treating them with larvicides can help reduce the breeding population of mosquitos. Community-based interventions have proven to be more effective in control of mosquito populations than intense, and less frequently administered control activities on the part of government agencies. These community-based approaches that focus on education and sustainability have proven effective in the control of *Ae. aegypti* in Cuba, where the measures were implemented to help reduce the incidence of dengue (Toledo et al., 2007). Surveillance of travelers returning from visiting areas in the Caribbean where CHIKV is present could potentially

ensure the disease does not become endemic in these regions (Morens & Fauci, 2014, p. 886). Similarly, developing rapid tests that can detect the presence of the disease in an infected individual early in those areas where CHIKV is in circulation allows for the isolation of the individual, ideally preventing them from being further bitten and transmitting the disease to others.

An approach that could also be used in addition to community education initiatives is the application of biological controls, such as *Bacillus thuringiensis*, larvivorous fish and snails, and nematodes. These are better suited to those environments where it is difficult to impose government oversight as a means of insuring compliance with vector control measures, and can be actively applied in those areas where outbreaks rapidly increase in severity. It can serve as a compliment to community education efforts about more passive but pervasive means of prevention (Gordon et al., 1990, p. 206). During extremely severe and widespread outbreaks like the one on La Reunion, the use of mosquito repellent was found to not have a significant effect in reducing infection rates, most likely because any lapse in vigilance with the application would result in infection (Staikowsky et al., 2008, p. 203). There is also a third method of vector control, one that ingeniously uses pre-existing populations of mosquitos to prevent further reproduction.

The sterile insect technique entails the release of large numbers of sterilized male mosquitos into the environment, where they breed with potentially infected females that then die before being to encounter a fertile male. This method has been used effectively in controlling screwworm flies, fruit flies, and moths in a variety of environments. The newest application of this idea is called RIDL, (release of insects carrying a dominant

lethal). Males are not sterilized but instead genetically engineered to be homozygous for a lethal allele, which when expressed in heterozygous offspring created breeding with wild, infected mosquitos leads to death. This method of control is extremely promising, but has yet to be tested in earnest and requires significant biomedical technology and government funding (Wilke et al., 2009, p. 69). For this reason, it would be difficult to deploy on a large scale in developing nations. Vector distribution is also a key component in understanding the epidemiology of CHIKV, the impact it has already had on the Americas, and the threat it poses to other regions with unexposed populations that frequently travel to areas where the virus is active.

The vector distribution is affected by a number of factors. *Ae. aegypti* is most commonly found in urban environments where water pools in containers and other receptacles. In the case of the DR, these are often the large 55-gallon drinking containers many families keep near their home for a steady supply of potable water. Development and periurban settings increase the number of breeding sites for *Ae. aegypti*. Howell and Chadee (2006) have shown that homes in urban areas in the DR have higher numbers of resting mosquitos than those in rural areas and increasing urbanization will produce conditions even more favorable to the proliferation of *Ae. aegypti*, in areas where population densities are highest (p. 71). Again, the intertwined nature of the biological, economic, and social is illustrated. Economic development in the DR is increasingly geared toward enterprises that are predicated on increased urbanization, such as tourism and the creation of IFZ's (Ferguson, 1992).

2.8 Future Areas of Inquiry

There are a few areas of research that should be pursued in order to better understand the behavior of CHIKV. First, there is the question of where the virus goes after epidemics pass through populations. In La Reunion, as well as in the Kerala state of India, the virus disappeared less than a year after its first appearance. It remains to be understood why the virus strikes in cyclical patterns: emerging suddenly, sweeping through a population, and then ‘vanishing’ (Setbon et al., 2008; Sudeep & Parashar, 2008). Although the virus can use sylvatic reservoirs to lay dormant while it is not actively infecting human populations, the question of exactly what reservoirs the virus utilizes still remains. The cycles it passes through in this regard allows time for the birth of new, unexposed individuals and the re-occurrence of an epidemic spread of the virus. Understanding where the virus goes when it is not actively spreading through populations is important in preventing its resurgence.

Another area of promising research concerns the impact of global climate change on the distribution pattern of not only CHIKV, but also other mosquito-borne diseases that have been considered non-issues for the U.S. and European nations for decades. The same climate and weather patterns that help explain the high prevalence of CHIKV in the Americas and Southeast Asia are beginning to appear in regions they are not usually associated with:

“While mutations to the chikungunya virus are responsible for some portion of the re-emergence, chikungunya epidemiology is closely tied with weather patterns in Southeast Asia. Extrapolation of this regional pattern, combined with known climate factors impacting the spread of malaria and dengue, summate to a dark

picture of climate change and the spread of this disease from south Asia and Africa into Europe and North America” (Meason & Paterson, 2014, p. 105).

The role that climate change will play in future patterns of infectious disease cannot be ignored (Meason & Paterson, 2014; Gubler et al., 2001; Hanania-Freeman, 2014). Increased temperatures and levels of rainfall will create habitats suitable for the proliferation of disease vectors in areas that previously were unexposed to these types of pathogens. The consequent increase in displaced persons that is associated with climate change will also lead to large populations of immunocompromised individuals entering areas where the disease is more likely to be in circulation.

While Staikowsky et al. (2008) and others did inquire about the use of native plants in the La Reunion outbreak, research remains to be done on the use of traditional herbal remedies for CHIKV in the Caribbean generally and the DR specifically. The effectiveness or ineffectiveness of these herbal remedies should be documented, as well as the interactions they have with more commonly prescribed analgesics used for the treatment of the disease. These same herbal remedies will likely be used for relief from symptoms of other emerging viral mosquito-borne diseases as well. Their affect on human health is important to document, as well as their efficacy in clinically relieving symptoms of the conditions they are used to treat. Identifying, documenting, and analyzing these medicinal plants could prove useful in future treatments for CHIKV and other diseases.

The problem of emerging infectious diseases, while thoroughly studied, continues to be an area of vital concern to global health. Increasing amounts of international travel and trade, combined with the accelerated development of poorly planned urban

environments in the developing world create conditions favorable not only the emergence and re-emergence of vector borne diseases, but also their rapid spread to locations distant from their origin and filled with immunologically naïve populations. Deepening social inequality around the world will no longer be an issue experienced only by those societies that suffer from economic and political disadvantages; the pathogens they suffer from will be rapidly transferred to developed nations through the economic ties that served to disadvantage them in the first place (Barrett et al., 1998; Inhorn & Brown, 1990). Proactive identification and treatment of these diseases in those areas where they first emerge will become increasingly vital, as well as solutions that seek to eliminate the source of the problem rather than merely the symptoms. Mosquitos spread diseases like CHIKV, but they are merely the proximate cause of the problem; the urban and periurban environments in which they thrive, rife with poverty and poor infrastructure development are the deeper issue. These conditions are, in turn, caused by global economic and political ties that are fundamentally unequal. Developed nations must begin to take steps to eliminate the political and economic conditions that give rise to environments conducive to the spread of disease, as the health of all of the world's nations becomes increasingly intertwined. This includes mitigating the effects of neoliberal economic policies, as well as addressing larger issues like global climate change. The future impact of vector-borne diseases will be shaped by the combined influences of biology, economic development, and climate change. For this reason, it is critical to examine the socioeconomic and political conditions in the DR that help shape the impact and experience of CHIKV contemporarily.

2.9 Tourism in the Dominican Republic

Tourism is becoming an increasingly important industry in the DR, and is only forecasted to grow in size in coming years. Despite the foreign capital that tourists and tourist resorts bring into the country, there is considerable debate as to the impact of this industry on the economic health of Dominican markets and the physical health of Dominican citizens. Scholars have noted that historical imbalances of power helped form the current patterns of international tourism: the first wave of international tourists were predominately from Western Europe and North America, workers with disposable income in the aftermath of WWII. Overwhelmingly, their destinations were those locations where an abundance of cheap labor could be found, usually countries that in the past were under the yoke of colonialism (Cabezas, 2008). Thus, historical political relations created conditions ripe for the growth of an industry that continued to exploit the citizens of nations that had already suffered under colonialism, and which indirectly promoted the spread and prevalence of infectious diseases. Verticalization and the proliferation of all-inclusive resorts makes it increasingly difficult for Dominicans to get jobs inside of tourist resorts, and those jobs they do manage to secure tend to pay extremely low wages. As a result, sexual tourism proliferates in the areas surrounding these resorts. It is informal, untaxed, and relatively better paying work that caters to tourists' desires (Cabezas, 2004). An increase in sexual tourism also brings with it an increase in sexually transmitted diseases and interpersonal violence. This threat is compounded by the emergence of new mosquito-borne diseases in the region that can be sexually transmitted, like Zika. Additionally, the large number of Americans that frequently make the DR their vacation destination in the Caribbean means that outbreaks

of epidemic diseases are bound not only to affect Dominicans, but also to travel back to the U.S. via infected individuals that may or may not be symptomatic at the time (Maron, 2014; Morens & Fauci, 2014). In fact, one of the key measures against the spread of CHIKV in the U.S. emphasized by the CDC as well as the PAHO and other public health agencies is self-monitoring on the part of travelers. Travelers returning from areas where CHIKV is transmitted should be vigilant for the appearance of any of the early symptoms associated with the virus. Staying indoors and minimizing exposure to mosquito bites while viraemic can help prevent the disease from spreading autochthonously in the U.S. via the bites of *Ae. albopictus* (PAHO, 2012; Chaves et al., 2012). The competency, control, and distribution of the mosquito vectors of CHIKV have already been discussed, but the role that socioeconomics play in the experience and distribution of disease, specifically CHIKV, must also be examined for a more comprehensive view of the phenomenon, as well as the probability of future epidemics similar in nature to CHIKV (Inhorn & Brown, 1990). For instance, the ability to destroy mosquitoes through the use of pesticides and prevent bites through the use of insect repellants is meaningless if a government or individuals in the country cannot afford to deploy these measures. This is a challenge facing the DR currently. Interestingly, though the U.S. does possess enough capital to invest heavily in the use of pesticides and many individuals can afford personal insect repellent, political forces have led to prohibitions on the use of the most powerful pesticides like DDT, due to the negative environmental impact of the chemicals (Hanania-Freeman, 2014). Both of these examples illustrate the important influence that socioeconomic and political forces can have on the impact of disease within a society.

Tourism is a rapidly expanding and critically important industry in the DR that provides an important source of revenue for the nation. It also leads to patterns of public spending, job creation, and foreign dependency that are harmful to the physical and economic health of the country. International tourism is increasingly becoming verticalized, with more and more resorts becoming all-inclusive, the jobs the sector creates within the DR are overwhelmingly low-paying, without benefits, and seasonal, and the Dominican government offers generous tax breaks to multinational corporations willing to operate and open resorts in the country (Cabezas, 2008). The downsides of this industry are obscured by the significant amount of revenue it brings to the country: in 2014 travel and tourism directly contributed 3.1 billion USD to the GDP, as well as directly contributing 187,900 jobs (WTTC, 2015).

An overall increase in GDP is not by itself a positive indicator of benefit coming to the nation from the tourism industry however. The DR's spending on education and healthcare are among the lowest in the Caribbean region (PAHO, 2012). The ability to levy taxes on the increased value in GDP is important, and frequently does not occur as a result of both the actions of the Dominican government and the business model of the multinational corporations that create and run resorts on the island (Ferguson, 1992; Cabezas, 2008). Many of the goods sold and consumed inside of the tourist resorts are imported from other countries, and are infrequently the product of Dominican labor (Cabezas, 2008). There are also patterns of public spending that develop centered on continuing to draw the business of multinational corporations, such as improvements to water infrastructure and roads within the resorts, at the expense of the development of surrounding communities. This is further compounded by asymmetrical spending power

between the multinationals that develop resorts within the DR and the Dominican government or domestic business. The industries are controlled by foreign investors from their inception. Their development leads to further concentration of wealth, and is partially a result of deregulation that occurred throughout the 1980s and into the 1990s (Ancochea, 2005). The benefits accrued due to the presence of the tourism industry disproportionately accrue to those with the capital to make the enormous investments required to create tourist resorts, and not average Dominicans who seek out low-paying and often unstable employment within or around the resorts. Even though the DR is a latecomer to the Caribbean tourist industry due to its checkered political past, including the U.S. invasion in 1965 and the dictatorial reign of Trujillo that lasted until 1961, the nation is rapidly becoming one of the most popular tourist destinations in the Caribbean. Concurrent changes in modes of livelihood and public spending have accompanied this shift (Cabezas, 2004).

Safety is one of the largest factors that tourists consider when deciding on a vacation destination. This is one of the reasons that depending on tourism as a major source of revenue can be risky. Natural disasters, political unrest, or public health problems can scare away potential tourists. Some of these factors are outside of the control of the Dominican government, and can lead to potentially volatile and unexpected drops in spending (WTTC, 2015). The fact that the tourism industry is largely dependent on investment from transnational American corporations shows a continuation of both a political and economic relationship of dependency between the DR and the U.S. Some scholars have argued that international tourism is a form of neo-colonialism, allowing developed nations to continue to direct and control the development and economies of

developing nations in a non-violent manner (Cabezas, 2008). The same ties that bind the U.S. and the DR also mean that diseases that become endemic in the DR have a real potential for being transmitted to the U.S. Not only that, but news of new diseases rapidly spreading in a country contribute to a loss of the tourist dollar. For instance, in the aftermath of Hurricane Jeanne in 2004 the frequency of malaria cases (a disease endemic to the country but not usually found in urban areas) the hotel industry in the DR lost more than 30 million USD (PAHO, 2012). Continued investment in tourism as a primary driver of economic growth is predicated on the stability of a number of ever-changing factors: the strength of U.S. and European markets (individuals vacation far less frequently during recessions), the absence of any serious natural disasters (with hurricanes predicted to become more severe and frequent as a result of climate change), the absence of significant public health threats (which can frequently emerge in the aftermath of natural disasters, compounding the impact of both events), and tourists' perceptions of personal safety when considering the nation as a potential vacation destination. Increased social inequality contributes to increase crime rates, and tourist anxieties about personal safety (WTTC, 2015).

In 1990, the DR brought in 900 million USD from its tourism sector. In contrast, the amount netted by the entirety of its exports was 734.4 million USD. Heavily reliance on and active promotion of the country's tourism industry will continue to increase the volume of travel between the DR and the U.S., and in turn, the chances of an epidemic outbreak in the U.S. It is estimated that in 2014 travel and tourism would directly contribute 3.1 billion USD to the DR's GDP and account for 187,900 jobs. These numbers, both in terms of revenue and employment, are only predicted to increase

(WTTC, 2015). This means that the effects of tourism and the policies that encourage it will most likely continue to intensify: “scholars postulate that tourism perpetuates existing disparities, fiscal problems, and social tensions” (Cabezas, 2008, p. 22). Evidence of the veracity of these claims can be seen in part by rapid increases in both the volume of tourists going to the DR and the industry’s contributions to the nation’s GDP in the absence of any significant increase in quality of living for many Dominicans. Diseases, including CHIKV, spread more easily and disproportionately affect individuals that find themselves in socially marginalized positions (Meason & Paterson, 2014; Farmer, 2004). Increasing economic inequality as a result of the presence of the tourism industry exacerbates pre-existing social inequalities and increases the prevalence of both mosquito-borne and sexually transmitted diseases. One of the contributing factors to cited increase in social tensions is the tendency for tourism to also increase the rate of internal migration toward those areas where tourism resorts are constructed.

Internal migration and the consequent disruption of traditional cultural arrangements remove workers from systems of social support in the communities they move from and also increases the rate of urbanization and risk of disease (Cabezas, 2004). Increasing urbanization leads to larger numbers of individuals inhabiting areas where they will be exposed to CHIKV’s vector *Ae. aegypti*. The presence of large numbers of high-risk workers in close proximity to tourist resorts also increases the chances that tourists in those resorts will be exposed to CHIKV. Combined with the usually short length of vacation times most tourists have in the DR a situation is created that greatly increases the chances a tourist will return home infected with the virus, potentially without exhibiting any external symptoms of the disease (Leparc-Goffart et

al., 2014). In this way, encouragement of tourism as a means of economic growth is deleterious in multiple ways: it places Dominican workers in tenuous social and economic situations that increases their chance of disease and marginalizes them as well as increasing the probability of the spread of the virus into other nations where it is not yet endemic, like the U.S. Another reason tourism does not produce increases in quality of living for the majority of Dominicans is the trend toward verticalization and consequent profit leakage.

Tourist resorts in the Caribbean in general have made a move toward verticalization, increasing the occurrence of ‘all-inclusive’ resorts. The creation of all-inclusive tourist experiences mean that visitors to the resorts never have a need to leave the resort to purchase local goods, consume local entertainment, or come into contact with local citizens:

“The all-inclusive tourist package allows tour operators and travel agencies to combine all of the components of a destination’s attractions-recreation, meals, food, lodging, and transportation-into a single product paid for at the point of origin. This limits the participation of local produces and confines the profits to the global North” (Cabezas, 2008, p. 25).

As a result, the revenue seen from each tourist has decreased overtime, while infrastructure and public spending has increased to bring in more resorts. This removes tourists from the reality of day-to-day life for Dominicans outside of the fences of the resort. It also provides the multinational corporations that create these resorts with tremendous bargaining power in relation to local businesses and the Dominican government (Ferguson, 1992; Cabezas, 2004). Because corporations are moving toward

homogenizing and controlling every aspect of the ‘tourist experience’, they place themselves in extremely favorable positions to negotiate with local businesses that vie for the opportunity to provide services and goods to tourists inside the resorts, often to the detriment of those businesses. This process also leads to profit leakage:

“A major problem is the high import content of construction material and equipment and the many consumable goods required to cater to the needs of tourists. It is difficult to bring local suppliers into the supply chain, since the good required by tourists may not be produced locally, and, when they are, tourists tend to reject them” (Cabezas, 2008, p. 27).

As time progresses, the economic and social position of Dominican workers will continue to deteriorate, and the Dominican economy as a whole will bring in less revenue from tourists while the incidence and risk of disease for Dominicans and international tourists increases.

Increasing reliance on tourism is problematic for a number of reasons. It is dependent on a number of factors that can change rapidly: the strength of the U.S. economy, the occurrence of natural disasters like hurricanes or epidemics, and the availability of other tourist destinations that have lower-paid workers and cost of living (Ferguson, 1992). Dependence on this industry as a major revenue stream exposes the Dominican economy to potentially crippling shocks, and creates unstable employment with few if any labor rights in locations divorced from laborers social networks. Multinationals that control these resorts have disproportionate spending ability and enjoy an asymmetrical share of the profits that originate in the resorts (Cabezas, 2004). While international tourism in the Caribbean is a classic case of ‘core’ nations capitalizing on

the resources of the periphery nations-tropical beaches and low-wage labor-it is unique in that it intertwines the health of the first world consumers with the health of producers from the developing world. The poor working conditions and infectious diseases that exist in manufacturing operations in developing nations are often of little or no concern to citizens in first world nations that enjoy the benefit of low-cost consumer goods; the mosquitoes that carry CHIKV make no distinction between service workers on the resorts and vacationing tourists. Infectious disease that affects low-income Dominicans also threatens tourists, and does not respect the income barriers that prevent many Dominicans from immigrating to the U.S. In this way, the exploitation that has historically existed between the U.S. and the DR binds together the health of both countries.

2.10 Industrial Free Trade Zones, Concessions, Neoliberal Reforms, and the Public Sector

Another aspect of the Dominican economy that directly affects the health of the country's citizens is a shift from agriculture to manufacturing (Pomeroy & Jacob, 2004). Like tourism, it ties the health of the Dominican economy intimately with the health of U.S. economy. IFZs have proliferated in the context of a large, low-wage labor force, absence of government regulations and labor rights, and attractive tax breaks and other concessions offered by the government in an attempt to increase employment (Ferguson, 1992). More generally, a process of neoliberal globalization has also affected the DR. Here, I will use Ancochea's (2005) definition of neoliberal globalization: "...the consolidation of a new global model of development driven by the competitive strategy of transnational corporations (TNCs), the expansion of the financial sector, and the shift in economic policy in both developed and developing countries" (Ancochea, 2005, p.

694). A long relationship of economic dependency on the U.S. has also created a pattern of concessions granted by the government to foreign investors in order to attract their business. Another legacy from the DR's political past that affects the current governmental decisions and economic patterns is widespread political clientelism, with contracts and tax breaks awarded to large families that have historically dominated the upper echelons of Dominican society and who were in good standing with Trujillo throughout his reign (Black, 1986). Policies and loans made by organizations like the International Monetary Fund have also impacted the way the Dominican government prioritizes its public expenditures. These factors coalesce to create an environment with weakened public sector employment and, in turn, epidemiological oversight, public spending directed toward improved industrial infrastructure, significant levels of government corruption and clientelism, and a focus on an increase in the GDP and overall quantity of exports of the nation rather than improved quality of life for Dominicans (Ancochea, 2005). The presence and impact of these processes are tied both the military and political history the DR has shared with the U.S., as well as the more general process of globalization and consequent neoliberal economic reforms that is unfolding in different ways in countries around the world. Again, the presence, distribution, and differential impact of CHIKV in the DR are tied to economic and governmental policies. These policies, in turn, have their roots in historical inter-relations with the U.S. These policies encourage dependence on U.S. markets rather than interdependence between the two nations (Black, 1986; Ferguson, 1992). The type of job creation being encouraged by these processes are also implicit in the massive emigration of Dominicans to the U.S., and consequent legal and illegal immigration of Haitians into

the DR searching for economic opportunity. These socioeconomic arrangements and international processes serve to deepen social inequality in the DR, while at the same time leading to cuts in public spending that would help improve the health of the nation's poor. They also increase the dependence and volatility of the Dominican economy while leading to gains in GDP in the short-term (Pinder, 2009).

2.11 Concessions

Concessions are not a new feature of the Dominican economy. In fact, they have been an integral part of developing nations economic strategies in the Caribbean basin for more than a century. Early industrialized nations (like the U.S.) tended to utilize government spending in order to encourage the growth and expansion of important industries like transportation. Less-developed nations, however, have traditionally used concessions as a means of enhancing the strength of a number of different sectors of the economy. In the DR, these concessionary policies go back to at least the beginning of the 20th century. This policy of concessions extends to various sectors of the Dominican economy, including railroads, mining, and manufacturing (Veese, 2009, p. 742). While this strategy does frequently lead to rapid development of particular portions of the economy, it also places ownership of the newly developed resources in the hands of foreign investors or already wealthy national elites. American involvement in multiple areas of the Dominican economy (especially sugar) is one of the reasons the U.S. was able to intervene in 1965, citing concerns for the safety of their national citizens located inside of the country. The Dominican government after the fall of the Trujillo was too disorganized to effectively manage these different monopolies for the good of the majority of Dominicans, or to reject U.S. involvement in their civil disputes (Veese,

2009, p. 758). This policy also leads to profits becoming concentrated either in TNCs or small, historically wealthy families in the DR. Both of these processes deepen social and economic inequality. The fragmentation and corruption left in the wake of Trujillo's reign are two factors that contribute to this ineffectiveness. Trujillo's eventual successor, Joaquin Balaguer, also continued his practice of awarding public contracts to national elites: "...the military under Balaguer siphoned off a large percentage of funds that would have otherwise been used for public investments" (Bray, 1984, p. 228). In the case of TNCs, these concessions also lead to tax-free import and export of manufactured goods that enter and leave IFZs (Bray, 1984). Alone, this propensity toward providing concessions to both domestic and foreign business interests would have a negative impact on control of the means of production within the DR as well as collection of tax revenue. Contemporarily however, these concessionary policies are also in place alongside overall reductions in public expenditure that are the hallmark of neoliberal development plans. This multiplies the impact of both the concessions and attempts to reduce the public deficit through cuts in public services. Besides reductions in spending on education and healthcare through decreased tax revenue, these policies also encourage the emigration of middle-class Dominicans to the U.S. where they seek jobs and wages in line with their education and expected wages. It is also another contributing factor to dependence on the U.S. economy for continued prosperity, and the consequent volatility of domestic markets. Concessions were originally used as a means of rapidly and effectively expanding different industrial bases, as well as insuring continued political loyalty from critical members of the political system. This practice was only intensified under leaders like Trujillo and Balaguer. Today, this strategy has translated into continued political

clientelism, a loss of tax revenue, and the significant presence and importance of TNCs that utilize Dominican labor and land without contributing any significant portion of their profits to the nation itself (Ancochea, 2005).

2.12 Industrial Free Trade Zones

IFZs are also another area of development the DR has pursued (like many other nations under the influence of neoliberal globalization) that has had a significant impact on the health and wealth of the nation. Partially constructed consumer goods are shipped to the DR to be completed or further constructed in these IFZs, which enjoy tax breaks on both imports and exports. Low hourly wages, a large, unskilled workforce in need of employment, and weakened labor legislation present attractive incentives for investors (Ferguson, 1992, p. 65). IFZs are usually built on the outskirts of urban centers. Individuals from the countryside are drawn toward urban centers as a result, often living in crowded or unsanitary conditions (Pomeroy & Jacob, 2004). The development of IFZs have a twofold effect on rates of CHIKV in the DR: abysmal working conditions decrease the effectiveness of laborers' immune systems and their ability to fight off infections, and they encourage rapid urban development which creates ideal conditions for further increases in the *Ae. aegypti* populations. This is another way that paths of economic development within the DR, affected by both domestic policies and foreign interests, are contributing to creating a pool of hosts more vulnerable to infection, as well as creating an environment more favorable to the reproduction *Ae. aegypti*. The logic of investing and attracting IFZs under the control of TNCs to the DR in part originates from the success seen in East Asian economies in the aftermath of WWII and the Korean War (Schrank, 2003). Developed (mostly Western) nations emphasized the importance of

export-led industrialization as a means of economic development. The hope was that through trade with developed nations, less wealthy nations would experience an inflow of capital from countries that would purchase the manufactured goods they exported. Although export-led industrialization among East Asian nations in the 1960s and 70s proved to be an effective engine of development, the emphasis on exports as a primary drive of development was misplaced. Other, critical factors explain the success of this strategy in these regional economies. The actions of external actors—for instance, Japanese investment in Korea and Taiwan—and the presence of specific internal factors—like human capital—were integral to the positive results seen from this strategy. One of the reasons the same model of export-led industrialization may have failed in the DR was a lack of ‘state capacity’, an absence of human capital, and the presence of a different regional economy (Schrunk, 2003). The contrast in economic performance between the East Asian economies and the DR highlights the ineffectiveness of a ‘one-size-fits-all’ approach of economic development, and reveals some of the factors behind the detrimental impacts of current trends in development in the DR (Schrunk, 2003, p. 434). IFZs in the DR thrive and depend on a ready supply of low-wage labor that generally has a high turnover rate. Unionization is forbidden, promotions do not occur, and the industrial complexes process material that originates almost entirely in another nation. The poor working conditions present in the IFZs is another driver of the emigration of the Dominican middle class to the U.S. (Black, 1986; Ferguson, 1992). Additionally, the IFZs are located near major urban centers, encouraging immigration to urban areas and placing even more strain on what is already poorly maintained public infrastructure. Larger concentrations of workers in urban areas, diminished health due to their working

environment, and a lack of income to spend on medical services all combine to illustrate the overall negative effect of IFZ's on both the public health of Dominican citizens and the already significant income gap in the nation. IFZs are also a fundamentally short-term solution to what is a long-term problem (finding a means of replacing the diminished agricultural sector): "Unrestricted profit repatriation means that foreign companies do not invest in the country, while tax concessions prevent the Dominican government from collecting badly needed revenue. The end result is the creation of 'footloose' offshore companies, with few long-term commitments to the Dominican Republic..." (Ferguson, 1992, p. 69). Not only do the IFZs not contribute to tax revenue or produce a skilled labor force, they are subject to being relocated as soon as another source of cheap labor becomes more readily available. The ties between economic policies, international trade, and disease are again reinforced: IFZs increase migration to urban centers, increasing exposure to CHIKV's vector. They deepen social inequality, making the workers that migrate to these areas more vulnerable to infection. Finally, they do not contribute to tax revenue that might be invested in public spending like education, healthcare, or water infrastructure that might help reduce the disease burden. Another important aspect of an emphasis on the construction of IFZs as a means of economic growth is the concurrent removal of barriers to free trade. Again, the removal of protectionist tariffs has been an aspect of the Dominican economy since the 20th century, partially as a result of their close relationship with the U.S. (Cambeira, 1997). The DR-CAFTA is one example of a free trade agreement that has had a negative effect on workers' rights in the country.

2.13 Free Trade

Pinder (2009) has analyzed some of the potential negative impacts of the DR-CAFTA agreement on Dominican citizens and the Dominican economy as whole. While IFZs are a concrete example of globalized neoliberal economic policies in the DR, the DR-CAFTA is a trade agreement that represents the logic used to promote the growth of export-led industrialization. The main idea behind these kinds of agreements is that when a wealthier, more developed nation trades with a less wealthy, less developed nation the primary benefits will accrue for the less powerful nation. The hope is that by opening the U.S. market to the Dominican economy the Dominican economy will grow. In reality, these agreements hurt both nations, albeit in a different manner. In the U.S., manufacturing jobs are lost as they are relocated to areas like the Caribbean with lower production costs and fewer workers' rights. In the DR, low-paying jobs that deepen social inequality in the country and put the health of workers at risk are created. Even then, if another nation or region can offer more tax breaks or lower labor costs these jobs might also be relocated outside of the DR. Pinder (2009) argues that the DR entered into this agreement as a result of desire for economic gain in the short-term: "I would argue that the question of enhanced access to the U.S. market, which seems to be their prime concern (and is in any case something of a myth), is a big mistake, since these poor countries lack the leverage to earn their way into the U.S. economy by being truly competitive" (p. 230). While it the DR-CAFTA does create jobs inside of the DR and allows for more ready access to U.S. markets, past experience with other free trade agreements like NAFTA has shown that often times they can serve to further impoverish already poor nations through forced participation on the 'even' playing ground of the

international economy. Pinder (2009) instead argues for the utilization of more long-term and strategic planning in order to improve the economies of nations like the DR: “For poor countries to benefit from free-trade agreements with more powerful nations, these agreements have to be equitable and not based on asymmetrical relations between the trading partners” (p. 231). The historical, political, and economic relationship between the DR and the U.S. has always been characterized by its asymmetry. These sorts of agreements serve to further expose Dominican markets to American exports, and allow further investment and capture of the Dominican economy by TNCs. For this reason, the author argues for ‘South-South’ trade agreements. These are trade agreements that have been made between nations in similar economic circumstances in the Southern hemisphere that allow for mutual benefit between both of the trading partners (Pinder, 2009). Free trade agreements like the DR-CAFTA further increase the dependence of the Dominican economy on the U.S. market, and worsen the position of laborers in both nations. Deepened social and economic inequality reduce the amount of money Dominicans have to spend on prevention and medicine, and encourage the concentration of large numbers of working poor in urban centers that already struggle with overburdened water and sanitation services (Pomeroy & Jacob, 2004).

2.14 Internal and External Migration

The creation of low paying manufacturing jobs in IFZs and low paying service sector jobs in and around tourist resorts are both encouraged in part by neoliberal trade reforms and historical patterns of relation with the U.S. These types of employment do not encourage social mobility, and do not emphasize the social and economic rights of workers. Instead, they promote economic stagnation and dependence (Pinder, 2009, p.

230). The outward migration of the middle class from the DR to the U.S. is an economic and social process that is influenced by globalized economic processes like free trade agreements as well as historical processes. Reduction of public sector employment has been happening since the 1970s under Balaguer, and continues today. Public sector employment was a mainstay of Dominican middle class society, and cuts to this sector further deepen the divide between the wealthy and the poor: “Trade liberalization and financial deregulation, together with an expansion of global financial flows and a growing presence of TNCs, led to a process of restructuring within domestic capital, affecting different segments of the capitalist class asymmetrically” (Ancochea, 2005, p. 696). Finance and banking sectors expanded and flourished in this context, while professionals like lawyers and doctors struggled to find patients and clients that had the income to utilize their services. Additionally, the burgeoning finance and banking sector of the economy was another example of economic expansion predicated on dependency with U.S. markets. When the U.S. experienced their ‘dotcom bubble’ in the 1990s, the DR suffered a severe banking crisis. It is estimated this crisis cost the nation “approximately 20 per cent of gross domestic product in 2003” (Sanchez-Fung, 2005, p. 738). This sort of volatility sends shocks through the Dominican economy. All of these factors explain in part why immigration to the U.S. has become more and more appealing to Dominicans over the years. This immigration further exacerbates economic and social inequality in the DR and hinders the growth of sustainable economy on the island. Bray (1984) argues one of the reasons for the outward movement of the middle class is an inability to form a common political identity and goal, and therefore secure economic opportunity: “It is argued that Dominican middle class international migration has

emerged as a partial solution to a political economic crisis that was dramatized by the April Revolution of 1965 and deepened through the 1970s with the failure of industrialization strategies to generate significant changes in the class structure” (p. 217). This outward migration draws the rural poor to urban centers as industrialization is increasingly emphasized and domestic agriculture suffers. Available landholdings are either extremely large and owned by TNCs or wealthy Dominican families that hire the sons of poor rural families to work their land on an hourly basis or they are highly fragmented and not large enough to provide subsistence for an entire family (Black, 1986). As poor rural families increasingly move toward cities and form a new working class, middle-class Dominicans immigrate to the U.S. Haitians that migrate both legally and illegally into the DR in search of better opportunities then fill the jobs left vacant in the countryside. Haitians in the DR do not have the same civil rights as Dominican citizens, and often work in extremely dangerous conditions out of necessity (Black, 1986). Increases in Haitian immigration-in part fueled by a general movement of the rural population to urban centers in search of manufacturing jobs-general social tension and political controversy over the presence of Haitians in the DR and the current state of immigration policy in the country. During times of social, economic, or political unrest Haitians are often scapegoated as the cause of issues that have their roots in much deeper, structural problems in the country (Cambeira, 1997). The presence of large numbers of Dominicans in the U.S. has also dramatically increased the importance of remittances for the Dominican economy. It is estimated that the DR received 2.7 billion USD in remittances in 2012 alone (Nwosu & Batalova, 2014). Again, the continued reliance on remittances as a major source of income for the country closely ties the DR’s economy to

U.S. markets. Downturns in the U.S. economy are difficult for Americans, but have disproportionately negative effects on specific parts of the Dominican economy (e.g., finance and banking). The immigration of many members of the Dominican middle-class to the U.S. increases urban poverty in the DR as poor rural workers migrate internally to urban centers for work. It also explains, in part, one of the reasons for both illegal and legal Haitian immigration to the country. Historical and contemporary feelings of hostility toward Haitians also bleed over into perceptions about the origins of CHIKV: some Dominicans mistakenly believe that CHIKV originated in Haiti, or came to the DR via Haitian labor migrants. Not only does this obscure the actual origin of the disease, it also contributes to the poor treatment of Haitians in the DR in general.

The experience of CHIKV in the DR is directly and indirectly shaped by the socioeconomic context in which the epidemic unfolded. The socioeconomic environment, in turn, has been shaped by the nation's history, especially its political and economic relationship with the U.S. This relationship has been characterized by the economic and military dominance of the U.S. over the DR, including two in the 20th century. Today, the DR continues to be economically dependent on the U.S. Export-led industrialization and tourism are both integral sectors of the Dominican economy, and public spending is designed to encourage the expansion of these sectors (Black, 1986). Tax concessions are provided to TNCs to locate IFZs and tourist resorts in the DR. Water and sanitation infrastructure is disproportionately created and maintained in and around tourist resorts. Both tourist resorts and IFZs create low-paying, unstable jobs and increase the rate of urbanization. Workers frequently do not have the income to allocate toward medical care and preventative measures against mosquito bites. They tend to live

in crowded, unsanitary conditions and place an increased strain on water and sanitation infrastructure that is already in need of maintenance (Ferguson, 1992). The TNCs that construct tourist resorts and utilize IFZs are often based out of the U.S. Again, the DR's dependence on the U.S. is maintained, albeit in a different form. Now, the patronage of TNCs guides development, whereas in the past this influence was exercised through military power. Earlier in the 20th century and during the reign of Trujillo the DRs dependence on U.S. markets was maintained through the export of sugar almost exclusively to the U.S. Unlike sugar, however, tourism and export-led industrialization are economic endeavors that are more volatile and vulnerable to relocation to any nation or region that offers the prospects of cheaper labor, less regulation, and more generous tax breaks (Pinder, 2009). This path of development reduces the tax revenue the government brings in and reallocates the public spending that does occur toward projects that are not directed toward improving the health, education, or sanitation services for the majority of Dominicans. Reduction in public sector spending has also decreased the size of the middle class. This is one of the reasons for the significant outmigration of middle class Dominicans to the U.S. (Schrack, 2003).

Rural to urban migration on the part of poor Dominicans searching for work has created an urban working class that does not have the income for services offered by middle class professionals, like healthcare and legal services. Middle class Dominicans are also motivated to immigrate to the U.S. (primarily Puerto Rico and NYC) because of the pre-existing Dominican communities present there. For example, a wave of Dominican immigration to the U.S. occurred during Trujillo's authoritarian reign over the nation (Bray, 1984). At that time, the immigration was politically motivated; now, it is

primarily motivated by economic circumstance. The middle class is immigrating to the U.S. for more promising economic opportunities, while the rural poor are immigrating to urban centers within the DR in response to increased industrialization and a decreased emphasis on the agricultural sector. Finally, Haitians are migrating into the DR to work in what remains of the agricultural sector, especially in regard to sugar cane cultivation (Ferguson, 1992). Increased Haitian presence in the country contributes to social and political tensions. Immigrant groups are frequently stigmatized or dehumanized as disease-carriers in epidemic contexts (Briggs & Mantini-Briggs, 2003). In the case of CHIKV in the DR, some Dominicans have associated the presence of the virus in the country with the presence of Haitians. Haitian cane-cutters also constitute a large sector of informal, unregulated, and untaxed labor that keeps the Dominican economy functioning in the face of continued transformation.

Currently, the DR encourages the growth of industries that produce economic gains in the short-term at the expense of sustainable growth, workers rights, and tax revenue. These decisions have also tied the Dominican economy closer than ever to the U.S. economy, in a position of dependence rather than interdependence. Investments in healthcare, education, and water/sanitation infrastructure could help improve the health and productivity of all Dominicans. This type of public spending helps in a number of ways. Improved drinking water availability will reduce the prevalence of large containers of potable waters near households. Improved sanitation services would reduce the amount of garbage in urban areas. Roadside trash and large water containers are both breeding sites for *Ae. aegypti*. Increased spending in the public sector can also improve the cohesiveness and efficacy of epidemiological surveillance that is critical in tracking

and controlling outbreaks of CHIKV, as well as other mosquito-borne diseases like malaria, dengue, and zika. It will also grant a greater number of Dominicans access to health services that can help with the reduction of severe symptoms (in the case of CHIKV), or curative treatment (in the case of other types of infections). These services will become increasingly important as the urban population continues to grow. Economic strategies should focus on long-term growth and sustainability. Public spending should prioritize the health of Dominican citizens and the quality of the infrastructure they utilize, rather than incentivizing the activity of TNCs within the country in the form of IFZs or tourist resorts.

CHAPTER 3

METHODS

3.1 Methods

Data was gathered over the course of a month (June-July 2015) in the city of Santiago de los Caballeros. A variety of sources were utilized in gathering information about the experience of CHIKV in the DR. Additionally, participant-observation, surveys, and semi-structured interviews were used in gathering information about opinions concerning the severity, cause, origin, and treatment of CHIKV. This study was approved for exemption from IRB review on June 15, 2015.

3.2 Participant-Observation

Participant-observation allowed for the exploration of personal opinions about CHIKV in the course of informal conversations with different informants. Availability of potable running water, quality of sanitation services in urban areas, and general opinions about health and sickness were directly and indirectly observed and recorded in field notes. The frequency of use of measures that reduce the incidence of mosquito bites was observed, including the presence or absence of mosquito nets, use of mosquito repellent, and presence of properly screened windows. Other behaviors were also included in field notes generated based on participant-observation as well, for example, the amount of time individuals spend outdoors rather than indoors throughout the day.

An average day during research and fieldwork usually consisted of waking up around 8:00 or 9:00 a.m. and riding to PUCMM. There research on history, biology, and economics would usually occur until around noon when lunch would be eaten. Afterward (sometimes after a brief nap) I would return to the university. Throughout the day I would have conversations with students, secretaries, and sometimes teachers about Dominican culture, current news, opinions about the virus, and more general topics. During my stay I also had the opportunity to visit Santo Domingo, the capital of the D.R. Santo Domingo is an extremely urban area of the country and has many hotels that foreign visitors stay in while visiting the country. Again, Santo Domingo also exhibited instances of roadside detritus and deteriorating civil infrastructure for water drainage. A particularly striking experience for me while touring Santo Domingo was the presence of a cruise ship in the harbor. The ship was enormous, shining, and new, dwarfing buildings and Dominican ships nearby. These large cruise ships serve as a constant reminder of the international nature of the country and the influence (and capital) that tourists and other nations exert on the D.R. This could keep the potential impact of other nations on the health of Dominicans in the forefront of national consciousness, and also illustrates the interconnected nature health. Tourists could be bitten and infected with CHIKV while in Santo Domingo and leave the country on the ship before becoming symptomatic. These ships frequently stop in other Caribbean nations as well the U.S., where the tourists could be bitten again by mosquitos there rapidly spreading the disease without knowledge of their role in the transmission of the virus. Throughout my stay I would often walk to small shops or small restaurants in close proximity to la Zurza, the neighborhood where I was staying. During these trips I noticed standing water in streets that lacked gutters or

otherwise had poor drainage, as well the tendency for many Dominicans to hold onto old items they thought may be useful in the future. For instance, old tires or broken down refrigerators could be seen lying in small fields or individual's backyards. This sort of debris provided ideal breeding grounds for mosquitos, and was widespread throughout the area I stayed in as well as other urban areas I traveled through. During daily travels I would also notice the prevalence of large water containers situated near peoples' homes, both on top of them and on the ground near them. Frequently these containers were uncovered. Again, these receptacles provide convenient environments for *Ae. aegypti* to breed in.

3.3 Surveys

Surveys were distributed in two locations: a public clinic utilized primarily by individuals of lower socioeconomic status (SES)-Juan XXIII-and the Pontificia Universidad Catolica Madre y Maestra (PUCMM), a private Roman Catholic university whose students generally derive from higher socioeconomic backgrounds than individuals that utilize public clinics like Juan XXIII (n=70). These locations were chosen for two reasons: they were readily accessible and would allow for the exploration of different attitudes about CHIKV that may be correlated with SES. The instrument was pilot tested and adjusted following feedback and recommendations from a secretary that worked at PUCMM. The questions found on the survey were closely based on and adapted from the survey used by Setbon et al. (2008) in their study, "Chikungunya on Reunion Island: Social, Environmental and Behavioural Factors in an Epidemic Context", published in the journal Population in 2008. There are significant differences between the delivery and intended audience of Setbon et al.'s (2008) study and my own: this is the

source of most of the alterations made to the questions found on the instrument. Setbon et al. (2008) reached a much larger sample size, and used telephones to administer the interview. In contrast, my research had a significantly smaller sample size, and the survey was administered in person. The surveys administered in Juan XXIII were carried out with the assistance of bilingual students from PUCMM that could read aloud the questions to individuals that might otherwise not have been able to participate due to illiteracy. Additionally, they helped explain some of the questions that generated confusion as a result of the terminology or phrasing used. The questions on the survey can be divided into prevention method questions, personal concern questions, behavioral questions, and societal/personal perception questions. Results from the survey were then analyzed along lines of age, gender, and survey location—then further into each of the four question groups. Although there were no questions that explicitly asked about annual income on the survey, the locations the answers were gathered from can serve as rough proxies for SES. A copy of the survey can be found in appendix. Surveys in Juan XXIII were administered in the waiting room of the clinic. Patients were approached and asked if they would be willing to participate. If they were incapable of filling out the survey due to problems with literacy the student would read the questions aloud to them and fill out their responses on the survey. If there was confusion as to the nature of the questions the student would explain the meaning of the question in another way the respondent might better understand. The surveys were all conducted in Spanish, both the written form and the verbal descriptions.

3.4 Semi-Structured Interviews

Semi-structured interviews (n=8) were performed with a range of individuals in a number of different professions and with varying SES. Some of the individuals interviewed include a doctor, a secretary, a small business owner, and a mechanic. The interviews were carried out with the assistance of bilingual students from PUCMM. If an individual answered a question in an especially enthusiastic or detailed manner they were encouraged to continue and impromptu questions based on their responses were asked to facilitate further information. The interviews were carried out in Juan XXIII, in small businesses surrounding Juan XXIII, at a local medical school, and at PUCMM. All interviews were translated, transcribed, and analyzed thematically for information concerning CHIKV like its potential origin, how serious it is perceived to be, and whether or not it could be cured. All semi-structured interviews were recorded in Spanish. Later transcription and translation of all the interviews was performed with the help of the bilingual students. The interviews were analyzed and coded thematically using Atlas.ti. All informants were informed that their participation was entirely voluntary and anonymous and that there would be no compensation for their participation. A copy of the interview questions can be found in appendix.

3.5 Sampling

Sampling for both the surveys and interviews was achieved through a combination of cluster sampling, convenience sampling, and snowball sampling. Clusters for survey distribution were identified in this instance as Juan XXIII and PUCMM. These locations were geographically near where I lived for the duration of the study and possessed a sufficient concentration of potential informants for the study.

Convenience sampling was utilized in this study in that the patients that were interviewed in Juan XXIII were individuals waiting to be seen for various medical problems or pick up medication and who agreed to participate on an individual basis. Convenience sampling also occurred in the shops surrounding Juan XXIII. Simply put, those individuals who seemed willing to take the survey or be interviewed were approached and asked for their participation. Snowball sampling occurred in the context of PUCMM. When one student took the survey and I asked them if they knew anyone else at the university that might be willing to participate they approached a public health professor about my study, allowing me to gain access to a class of public health students. No names were attached to the surveys and respondents were notified their participation was entirely anonymous and voluntary. They were also informed that they were free at any time to stop taking the survey or end the interview, and that they would receive no compensation for their participation in the study.

3.6 Limitations

There are a number of different limitations with this study. First, there were sampling disparities because of the method of sampling utilized. For instance, there were significantly more female respondents than male respondents. The reason for this significant gender imbalance is not apparent. It may have to do with the locations used, or the use of female translators. Secondly, the time period the research was conducted over imposed constraints on the number of participants; research was carried out over the course of a month. With a larger time frame more participants would have been secured. Due to my lack of fluency in Spanish, there was also significant reliance on interpreters in the administration of both interviews and surveys. There is the potential that certain

questions or messages could have been misunderstood from either the survey or interview. Additionally, both the surveys and interviews were conducted exclusively within the city of Santiago de los Caballeros. Performing this same study in areas of the DR with higher rates of tourism would likely have yielded different findings.

CHAPTER 4

DATA ANALYSIS

4.1 Semi-Structured Interviews

A total of 8 semi-structured interviews were conducted, with the majority of them (5) occurring on July 13, 2015 in small shops located in the community surrounding Juan XXIII. The other 3 semi-structured interviews were conducted at PUCMM and a nearby doctor's office. Copies of the interview questions can be found in appendix B. The interviews were conducted with the help of bilingual students from PUCMM. The interviews were tape-recorded, translated, and transcribed. The transcripts were then analyzed and coded thematically using Atlas.ti.

Multiple themes emerged during analysis. These themes are broad, and include: the role of the government in relation to the prevalence of CHIKV, the increased vulnerability of the poor to infection, the potential origins of the disease, and CHIKV's perceived severity in relation to other mosquito-borne diseases. Each theme contains interesting as well as contrasting opinions about different facets of CHIKV and Dominican society. Some of the topics covered under the theme of the role of the government in relation to CHIKV include: whether or not government control efforts were effective (or existent), what actions the government should take to prevent the disease, and ambiguity surrounding investment in treatment or prevention. The topic of poverty and vulnerability to CHIKV also contained multiple elements including: what

aspect of poverty makes and individual more likely to contracting CHIKV, whether or not a 'cure' could be purchased (along with the idea that wealthy people don't catch the disease), and finally whether or not the poor suffer more frequently and severely from CHIKV due to an inability to avoid infection or due to an inability to afford treatment after the fact. Opinions on the origin of the disease (as well as whether or not it is spread by mosquitoes) was another theme that encompassed different opinions on the potential source of the virus including theories that a contaminant had somehow entered the Haina river causing the epidemic, the idea that Haitians might have introduced the virus to the DR, religious explanations, government conspiracies, and generalized ideas about the negative impact of 'waste' on the nation's health. The severity and personal experience of CHIKV's symptoms contained points including CHIKV's especially deleterious effects due to persistent arthralgia, its all-encompassing presentation of physical symptoms, its impact on mobility and ability to work, and the smaller threat that it poses because of its low mortality rates (in comparison to diseases like Dengue). While some of the opinions expressed have ties to deeper, historical processes in the DR (like CHIKV's potential association with Haitians) other seem to find their origin in contemporary conspiracy theories, or personal opinions of government efficacy and truthfulness.

One of the themes that emerged during coding was the efficacy of the government in relation to the spread of CHIKV. Of the 7 interviews in which the role of the government was discussed, two of the respondents believed that government efforts were effective, but were unsure of exactly what it was that the government was doing to help with the epidemic. Faith in government efforts is in part based on citizen's historical

experience with government action and initiatives, and also influences whether or not individuals respond positively to messages concerning the control of the disease, especially through prevention of mosquito bites. The following is an exchange between the two respondents that believed government efforts were effective, but were still somewhat unclear on what exactly the government was doing or could do to help fight the disease:

“Interviewer: Do you think government efforts are efficient?

Respondent: Yes

Interviewer: Do you think they work?

Respondent: Yeah of course

Interviewer: Why do you think they work?

Respondent: Well I don’t know, but they are making an effort to control it.”

(Interview 1)

“Interviewer: Do you think government prevention efforts are effective at preventing chikungunya?

Respondent: Yes. Because they helped the hospital

Interviewer: But to prevent it?

Respondent: Yes, they helped the hospital.

Interviewer: What do you think the government should do to prevent illness transmitted by mosquitos?

Respondent: I don’t know.” (Interview 3)

Having confidence in government efforts to control and prevent CHIKV likely reflects a general approval of the current government administration. The inability to pinpoint any specific government sponsored interventions could suggest two things; one possibility is that Dominicans have not heard about government efforts to combat the disease because the government is not publicizing their efforts sufficiently enough, secondly, if the respondent is unsure of the vector or treatment for the disease they would be unable to identify measures to ameliorate the effects of the disease on the population. Only one respondent seemed to be unsure of whether or not the government was effective in its efforts to control the disease:

“Interviewer: Do you think the efforts the government is making are effective?

Respondent: In some cases.

Interviewer: Which cases?

Respondent: Well how can I explain? There are certain circumstances that can help a human being. But when you go to a hospital to get cured you need to buy everything yourself.

Interviewer: But we are talking prevention, not getting it.

Respondent: They promise things, but don’t follow through.” (Interview 4)

Although the respondent did not identify exactly which cases of government intervention were effective, he did note that a large obstacle in reducing the impact of CHIKV on the population was the prohibitive cost of drugs that would be recommended if an individual went to a doctor. This line of thought also emerged in discussions of poverty as a factor that increases vulnerability to infection. He also notes that while the government may promise to do particular things, they do not always follow through. Again, opinions on government efficacy in relation to the control of the epidemic were likely dependent on an individual’s pre-existing perception of the government, rather than specific functions the government has carried out in response to CHIKV. The belief that government efforts were ineffective was more common than its converse, with varying explanations for the reasoning behind the opinion. Here are some excerpts from individuals that felt the government was not doing enough in response to CHIKV:

“Interviewer: Do you think the efforts of the government are helping prevent the spread of the disease?

Respondent: No I don’t think so. Because they don’t invest in healthcare.

Interviewer: What do you think the government can do to reduce the spread of CHIKV?

Respondent: Well, what can I tell you? I don’t think it’s the waste, but in case it is, they should stand up for the people and protect the country for not allowing people to dump waste in our land. Because I don’t think it was mosquitos, I don’t think mosquitos just randomly come and bite everyone” (Interview 2)

This respondent believed that government efforts were ineffective because they were not investing in healthcare, the only way the respondent felt the disease could be controlled. This is an interesting contrast to the respondent in interview 3 that thought the government was helping fight the disease because they were investing in hospitals. It is also important to note that the respondent revealed their disbelief in the idea that mosquitos were the cause of the spread of the disease. Earlier in the interview, she mentioned that the father of her child believed the disease could have been brought here because of contamination from a ship with Chinese passengers on it that passed nearby Dominican rivers and contaminated them. In that context, she mentioned this belief as a misperception about the disease. It is interesting then that later in the interview she highlights the importance of protecting the nation from foreign waste, explicitly ruling out the possibility of controlling mosquito populations as a means of prevention as she did not believe they were the causative agent. It seems that the presence of mosquitos before the arrival of the disease generated doubt in regard to their role in transmission of the virus. Another respondent also felt that the government didn't do enough to prevent or control the disease, but offers very explicit advice on what should be done to help control the disease:

“Interviewer: Do you think the efforts the government is making are effective?

Respondent: I wouldn't know what to tell you to be honest because almost everyone got it. So it isn't effective.

Interviewer: What do you think the government could do to reduce diseases transmitted by mosquitos?

Respondent: Clean more, get rid of stagnant water, S.A.N.I.T.Y. should take more care of those areas where it is a large problem, and people who come into the country and leave should be better monitored and treated. There are people who come from Africa for example and can bring any illness. I think that is a really good thing for the government to do.” (Interview 5)

While it should be noted that a large portion of the population becoming infected with a disease does not necessarily mean government efforts were totally ineffective, the detailed response to the second question asked is worth examining. The respondent specifically advocated for the removal of stagnant water (breeding grounds for *Ae. aegypti*), and the intensification of efforts on the part of S.A.N.I.T.Y (a government group that focuses on removing waste that could hold water and treating potential vector reservoirs with pesticides). Both of these measures would produce demonstrable results in reducing mosquito populations and mosquito-borne diseases. She also mentions the need for the government to better monitor and treat visitors from other nations that may be ill, specifically citing Africa as an area of concern. Suspensions about Africans are likely tied into to prejudices toward Haitians, who some Dominicans believe were responsible for the introduction of CHIKV to the country. The respondent's opinion on effective measures to control the disease reflects her knowledge of its mode of transmission. Her specific mention of Africans as foreign travelers that may bring disease to the country also reflect more broad cultural perceptions of things related to Africa as being unclean, dark, or dangerous. An interview conducted with a Haitian doctor also led to similar responses, that the government should invest more heavily in prevention methods:

“Interviewer: Why is it so difficult to prevent mosquitos in the DR?

Respondent: It is part of the government politics. The government doesn't invest enough money in preventative healthcare...Our culture in the DR, the government wants to spend money on medicine. But no one believes they actually invest money in that. They should do that, they should do that. That's the best way, but they don't do it...some spending in preventative medicine, but not enough. If the government would educate people and use social media about it they could reduce dengue cases” (Interview 6)

Again, the importance of control methods that prevent mosquito bites are emphasized in reference to the control of a mosquito-borne disease (in this case, dengue). It is also important to note that he mentions Dominican culture as being willing to invest money in purchasing medications, but not necessarily preventative healthcare, which in this case includes education about disease and mosquito-bite prevention methods. The suggestion to use social media as a means of spreading the message is also intriguing, and could eventually lead to successful online campaigns that spread basic health information messages about diseases like dengue and CHIKV.

Another theme that was found during coding was increased vulnerability of the poor to infection. All respondents agreed that if an individual were poor they would be more likely to contract CHIKV and suffer from a more severe case of the disease. One of the most frequently cited reasons for this belief was the inability of the poor to pay for treatments recommended to them by medical personnel:

“Interviewer: Do you think people with fewer resources have a higher probability of being infected with CHIKV?

Respondent: Yes, that’s true. There are people without the resources for the treatments

Interviewer: But I mean the chances of being infected

Respondent: Yes there are many possibilities because of the way they live, you get it? Their living conditions” (Interview 1)

“Interviewer: So do you think people with fewer resources have a higher probability of getting CHIKV?

Respondent: Yes I think they do.

Interviewer: If those people get CHIKV do you think they will have a more serious case?

Respondent: Yes, because for example a poor person has ‘x’ problem and gets CHIKV. It will be worse. But if a rich person gets CHIKV they simply...

Interviewer: What about getting infected? Is it a higher probability for poor people?

Respondent: Yes, because our defense is lower, the food we eat is not as nutritious, for example I met people that have really serious cases, it depends on if they have another serious illness.” (Interview 2)

The need to clarify whether or not a person was likely to get CHIKV as opposed to whether or not they would be able to access treatments once they were infected was frequent. This suggests that Dominicans conceive of a disease in terms of how they will be able to treat it after they have contracted it, rather than considering methods that might increase their chances of avoiding infection altogether. These two excerpts also reveal two underlying risk factors that the respondents were aware of: nutrition and pre-existing illness. Both of these factors do play a role in the chance of contracting a disease as well as how serious the case will be after an individual is infected. Another interview illustrates the same assumption that infectious disease is something that has to be dealt with after infection rather than before:

“Interviewer: Do you think people with fewer resources have a higher probability to catch CHIKV?

Respondent: Yes, that’s true. Because sometimes we don’t have resources to go to doctors.

Interviewer: To prevent it, not cure it.

Respondent: Poor people are the ones who get more infected because we don’t have the resources we always get more illnesses than rich people.

Interviewer: People with fewer resources, do they get more serious cases when they have it?

Respondent: Yes, because with resources you can go to any clinic and receive inpatient treatment. They control the pain with medication there. We poor people have to endure the pain. We need to be brave.” (Interview 3)

Again, the need to clarify the meaning of the question was present, in that an individual would not go to a doctor before they had a disease like CHIKV to prevent it (there is no vaccine). It is also important to note that many of the respondents to the interviews used ‘we’ and ‘us’ in reference to the threats faced by the poor in relation to infectious disease, indicating their membership in this class. As these interviews were conducted in the community immediately surrounding Juan XXIII, it is further evidence that many of the

patients that seek treatment there would be considered poor by other Dominicans. The role of medication in controlling pain rather than curing the disease is also highlighted in this excerpt. This is important to note as survey results showed a large number of individuals that thought there was a cure for the disease. The end of the response is also telling in that the respondent agreed they would have to endure the pain (relief is not an option), and also that poor people must be brave. While there is a definite sadness or frustration that the poor must face the pain, there is also a hint of pride in that the poor must be brave given their situation (suggesting the rich do not necessarily need to have such virtues). The inability to buy medicine as a factor in causing more severe cases of CHIKV is highlighted here, but other respondents observed that many poor people would not be able to afford the fluids needed to stay hydrated while suffering from a febrile illness like CHIKV:

“Interviewer: Do you think people with fewer resources are more likely to have CHIKV?

Respondent: Possibly, in fact they just have more serious cases because no one is exempt from being infected. They also may not even have the possibility to medicate. Those people who don’t take medicine or hydrate have it worse.

Interviewer: Do you think they would be more likely to get it though?

Respondent: Yes of course they have water accumulated.

Interviewer: Do you think people with fewer resources would have more serious cases of CHIKV?

Respondent: Yes of course, because a poor person, how many Gatorades can he take a day? With the quantity of money a poor person would need to buy a Gatorade they could cook dinner for their entire family. You have to take a Gatorade every half an hour!”(Interview 5)”

The emphasis on hydration when infected with a febrile illness reflects previous experiences with diseases of this type that are prevalent in the region. Drinking plenty of fluids is vital to avoiding complications associated with diseases like CHIKV and speeding up recovery times. This is also the only response that frames the question of

healthcare in an either/or proposition. Either an individual could buy the fluids they would need to stay hydrated, or they could buy enough food to feed their entire family. This shows the dire economic circumstances many Dominicans find themselves. The problems associated with the epidemic spread of disease do not occur in isolation. They serve to further exacerbate pre-existing economic struggles faced by many Dominicans. Again, the influence that socioeconomic context has on the experience and spread of disease is demonstrated by these responses; the disproportionate risk faced by the poor in relation to CHIKV was acknowledged by every respondent. In contrast, the theme concerning the potential origins of the disease exhibited much greater variability. There was however a theory on the origin of CHIKV's introduction to the DR that was mentioned by two separate respondents:

“Interviewer: Do you have any friends or family that have misconceptions about CHIKV? About where it comes from, what it is, how it is spread?

Respondent: Yes. Some of them think for example, the father of my kid, he thinks CHIKV it was because of ships that with Chinese people that passed near our rivers and spread contamination.” (Interview 2)

“Interviewer: How do you think people get CHIKV?

Respondent: Many people think it was something viral. Many people say it was remnants brought from the Haina river. There were some ships that came through and their residue contaminated the river and caused the wave of CHIKV.” (Interview 6)

The belief that some form of contamination entered the Haina river and caused the disease was repeated by two separate respondents in two different locations. While this is not the means through which the virus arrived in the DR, the popular misconception that contamination in the river led to the epidemic is worth documenting and analyzing. The Haina river may be rumored as a site of introduction for the virus because of its infamous history with contamination: in the 1990's Haina de Bajo was termed the

‘Dominican Chernobyl’ due to extreme levels of lead contamination in the river, caused by a nearby car battery recycling factory (Blacksmith Institute). This recent experience with illness due to contamination in the environment could have had an effect on the individuals’ willingness to attribute the cause of new ailments to this body of water and the introduction of contaminants by outsiders. Identifying misconceptions about CHIKV like this one provides the government or other health agencies with the opportunity to not only reiterate the actual vector of the disease (mosquitos) but also to refute these beliefs specifically. This may increase the number of individuals that practice personal protection measures intended to prevent infection. Some other misconceptions about the origins of the disease included the belief that Haitians may have brought the disease to the DR, as well as non-specific beliefs that CHIKV is a virus but that it is not spread by mosquitos:

“Interviewer: Do you have any friends or family that have misconceptions about CHIKV or where it came from?

Respondent: I have a few folks, yeah. Because they don’t know how to prevent it or the first symptoms.

Interviewer: Do you think mosquitos transmit CHIKV?

Respondent: No.

Interviewer: What do you think spreads it?

Respondent: I think it is a virus that is around.

Interviewer: How do you think it is spread?

Respondent: I don’t have any idea” (Interview 4)

“Interviewer: What about external agents that introduced the virus to the island?

Respondent: I don’t know the answer because I haven’t done a lot of research on it. A lot of people say, but I don’t know if it is true, that Haitians have brought it, but I cannot confirm that information, I keep myself from answering that because I do not know the information. But I don’t if you’ve also heard of it” (Interview 7)

The hesitation to believe that mosquitos transmit the virus may be tied to previous experiences with other mosquito-borne febrile diseases that have historically affected

Dominicans, like dengue. Because diseases like dengue were not as widespread or acute as CHIKV, some may have doubted the official messages claiming that mosquitos were the vector the disease. The belief that Haitians may have brought the disease to the DR most likely stems from pre-existing negative connotations surrounding Haitians, especially migrant workers. Both of these misconceptions mask the true nature of the diseases' transmission, and serve to only further marginalize a segment of Dominican society that already suffers disproportionately because of their nationality. The subjective experience of CHIKV is also important to document when attempting to understand cultural perceptions surrounding it. Likewise, understanding CHIKV's severity in relation to other disease's that are in circulation in the nation is important as this can have an impact on the implementation of personal prevention methods. The following excerpts emphasize the painfulness of the arthritic symptoms that accompany CHIKV infection, and the immobility it can cause:

“Interviewer: What happens with other mosquito-borne diseases? Do you think they are worse or not as bad as CHIKV?”

Respondent: Wow they are not as serious as CHIKV. Because CHIKV doesn't allow you to move and it takes time and there are other people that apparently were cured and months later still had arthritic pain.” (Interview 1)

“Interviewer: Have you had CHIKV?”

Respondent: Yeah everyone in my family has had it.

Interviewer: How would you describe how it was?

Respondent: That was the worst thing that has ever passed through my house. It was something disastrous. Like no one can even mention it in my house. It was very hard, even the housemaid had it. We felt a lot of pain, fever, it is uncomfortable being able to move, and the allergy is maddening. But the worst thing is the pain, even if it goes away it takes a long time to really pass. I cant even wear high heels yet because my legs hurt a lot. And I am going to therapy because I had a really serious case to be honest” (Interview 5)

The persistence of the pain caused by CHIKV was one of the major points mentioned in every account of personal experiences with the disease. This same persistent arthritic pain also prevents sufferers from going to work, a problem that can have dire consequences for individuals that are already in tenuous economic circumstances. One of the few redeeming factors of CHIKV is that it is usually not fatal, a fact mentioned by respondents in their comparisons of CHIKV to other diseases:

“Interviewer: How severe do you think it was compared to other illnesses you have gotten?

Respondent: Well I can’t really compare it to any other disease. Because a worse illness than that one would be a terminal one. But compared to not so severe disease, CHIKV is worse because you keep having the effects of the disease for a long time afterward. I still sometimes feel pain in my arms. They hurt me and my legs bother me. And I know they are effects from that illness” (Interview 6)

“Interviewer: How would you compare the transmission of CHIKV to dengue?

Respondent: To me, talking about the diseases, they are similar. And they even are alike in the way they are transmitted...CHIKV I’m not saying it cant kill, it can kill you, but it doesn’t have an effect as dangerous as dengue. If dengue becomes hemorrhagic it can kill you. The CHIKV has very bad pains, but it doesn’t have the same significance as dengue...because when you have CHIKV your platelet count doesn’t drop. Just hard pain. It has killed children here, and people from the third generation generally, because they are people with low immune defense” (Interview 7)

While CHIKV is not usually fatal, large-scale epidemics increase the risk of the young, the elderly, and individuals that are already suffering from an infection of contracting the virus and potentially dying from complications associated with it. Reports of personal experiences with CHIKV also illustrate the fear that individuals have of contracting the virus despite the fact that it usually is not fatal. The acute pain associated with CHIKV and the persistence of the symptoms are two of the most commonly recounted aspects of individuals’ illness experience. While a list of common symptoms associated with CHIKV may communicate in a clinical sense the nature of the disease, personal accounts

of infection with the virus help explicate the subjective experience of the disease and can reveal the public's willingness to avoid infection as well as the meaning-making that goes on behind the objective, scientific manifestation of the disease's symptoms. The use of semi-structured interviews allowed for the collection of personal accounts of infection, anecdotes about the origin of the disease, and opinions on government efficacy. This sort of data cannot be gathered in a survey, though some of the themes that emerged in the interviews are echoed by results found in the survey data.

4.2 Surveys

70 surveys were successfully distributed and completed by individuals in the Dominican Republic between June and July of 2015. The surveys were filled out anonymously by individuals over the age of 18 at either Juan XXIII or PUCMM. These surveys asked participants questions about: demographics, prevention methods, personal concern, behavior, and societal/personal perceptions. It should be noted that answers to particular questions are weighted more heavily in considerations of significance throughout the analysis. For instance, the beliefs that the disease is spread through the air, or that mosquitos are not the sole method of transmission for the disease could be thought of being more significant for control efforts than whether or not the virus entered the country from toxic waste. This is because the belief that mosquitos spread the disease is critical to the implementation of personal protection methods against the disease. The belief in the origins of the disease while interesting and indicative of wider cultural and social influences, do not necessarily directly impact the use of protection methods. For instance, if an individual believes the virus is spread by mosquitos they may still use protection methods to protect themselves against infection, regardless of whether or not

they think the virus may have originally come Haiti or contaminated rivers. The separation of the data by survey site, age, and gender allows for the identification of trends in belief and protection methods along smaller subsets of the population. These divisions could help identify particular segments of the population more or less likely to suffer from the disease, more or less likely to implement particular protection methods for themselves or their family, and believe official government messages about the disease. Some patterns that might not have been apparent at the level of sample-wide analyses emerge more clearly when the sample is broken down examined in the context of specific age groups, gender, or survey site. Identification of particular patterns of belief in specific segments of the population allows for the application of future intervention methods or health messaging that especially targets those groups most vulnerable. For instance, social media might be used to better reach and target university age individuals while messages about the disease that are tailored for older individuals may be broadcast during breaks in daytime television shows that the elderly tend to watch.

4.3 Demographics

A breakdown of the demographics of survey participants can be found in Table 4.1 (pg. 80). This shows the reported race/ethnicity, gender, age (broken down into four age brackets), and number of individuals surveyed at each site (clinic and university). The inclusion of a race/ethnicity category on the survey proved rather ineffective, as many respondents (49 of 70) simply classified themselves as Dominican and no other reported race/ethnicity (Haitian, Mulatto, Hispanic, etc.) had more than eight responses. This could be in part due to the way the survey was set up; if the survey had participants

circle pre-written races/ethnicities then there might have been a more varied response. Also, there were threats of a massive deportation of Haitians in the DR during the time the survey was being distributed (Alcindor, 2015). Although these responses rendered

Table 4.1 Demographics of Individuals in the Dominican Republic Who Completed the Chikungunya Survey

Age	Less than 20	20
	20-29	25
	30-39	9
	40 and Over	12
	No Response	4
Gender	Male	16
	Female	51
	No Response	3
Race	Dominican	49
	Haitian	4
	Mulatto	8
	Hispanic	3
	Other	3
	No Response	3
Site	University (PUCMM)	20
	Clinic (Juan XXIII)	50

the category ineffective as a reference point for responses, it demonstrated the unique conceptualization of race and nationality among Dominican citizen. This is an area of inquiry that could be studied more extensively in the future.

In terms of age distribution, far more young people responded to the survey (Table 4.1). Fully 78% of respondents were between 18 and 29 years old. Respondents younger than 20 years old made up 28.5% of the participants, while 35.7% were between 20 and 29. The 30-39 age group was the least represented, making up only 12.8% of

respondents. There are a few potential reasons for this distribution: younger people are likely to be overrepresented at the university site, many of the adults in the 30-39 age group were likely to be working during the hours the clinic was polled, and number of medical problems tends to be directly proportional with age so the oldest age group was more likely to be at a clinic and seeking help for medical ailments. Additionally, the Dominican population as a whole is relatively young; 45.92% of the population is below the age of 24 (Central Intelligence Agency, 2016). Illiteracy also seemed to be more common among older individuals, leading them to hesitate to participate in the survey. There were assistants available to read the survey out loud to the participants but the lack of privacy lead some individuals to be more reluctant to participate and it was time consuming for the ones who agreed to still complete it.

Women constitute another disproportionately represented category of respondents; 73% of respondents were women (Table 4.1). There are a few possible reasons for this. Women may be more likely to seek medical treatment in clinics, as well as pursue tertiary education in universities. Both of these trends may have contributed to the large number of female respondents. Another factor that may have influenced these results was the use of female research assistants, which may have led to a higher number of women being willing to participate in the survey.

The final aspect worth noting about the demographic make-up of respondents is the greater number of respondents from the clinic in comparison to the university; 70% of respondent participated in the survey at the clinic. A major reason for this is the ease of access: many of the individuals approached at the clinic were waiting to be seen by a doctor or pick up medication and, therefore, were not otherwise engaged. Many of the

students on the campus of PUCMM were either on the way to class, doing homework, or heading to social engagements. Another reason one of the most productive distribution efforts at the university was achieved because I managed to gain access to a classroom where a professor was kind enough to allow me to distribute the survey to her public health class.

4.4 Prevention Methods

The reported number of prevention methods used by survey respondents is depicted in Table 4.2. This shows the frequency of use of six different types of mosquito prevention methods common to the DR. The most utilized prevention method was fans;

**Table 4.2 Total Numbers and Distribution of Prevention Methods
Used by Chikungunya Survey Respondents**

Prevention Method	Number	Distribution (%)
Mosquito nets		
Yes	27	39
No	43	61
Fans		
Yes	46	66
No	24	34
Skin Repellants		
Yes	29	41
No	42	59
Mosquito Coils		
Yes	5	7
No	65	93
House Sprays		
Yes	19	27
No	51	73
Destruction of Breeding Sites		
Yes	19	27
No	51	73

mosquitos are weak flyers and struggle to navigate in rooms with strong air flows. However, the high average annual temperature in the nation and the lack of indoor air conditioning means that most Dominicans use fans in their home regardless of whether or not it is intended to prevent mosquito bites. The second most used method of preventing mosquito bites was skin repellants, which were used by 41% of respondents. It should be noted that this is the only prevention method designed to protect an individual from mosquito bites rather than protecting an area from mosquitos. Destruction of breeding sites is the most effective means of avoiding mosquito bites, but was tied with house sprays as the fourth most frequently used prevention method. The least utilized method was mosquito coils, possibly due to their prohibitive cost or reliance on electricity to function.

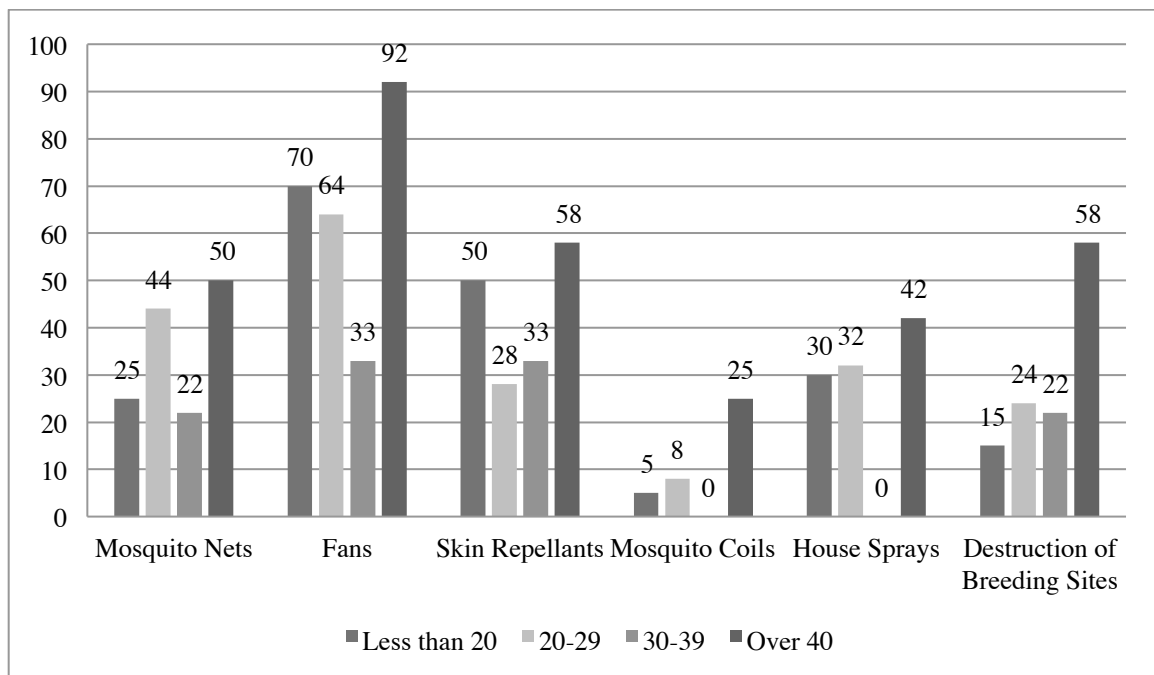


Figure 4.1 Percentage of Prevention Methods used by Chikungunya Survey Respondents Based on Respondent's Age

Figure 4.1 shows the frequency of use of the six different prevention methods across four different age ranges. Individuals in the 30-39 year old age group, while being composed of a smaller number of individuals relative to other age groups, reporting use only one prevention method at the highest frequency as well. Other age groups usually indicated that they used multiple prevention methods per person. In contrast the 40 and older age group reported using each method more frequently than any other age group. Specifically the 40 and older age group was twice as likely to say they destroy breeding sites and use mosquito coils compared to the other age groups. This could be influenced by this group's increased vulnerability to mosquito-borne infections or past experiences with epidemic outbreaks of mosquito-borne diseases like dengue in time periods when medications or chemical control methods were less widely available.

Figure 4.2 shows reported frequency of use of six prevention methods by gender.

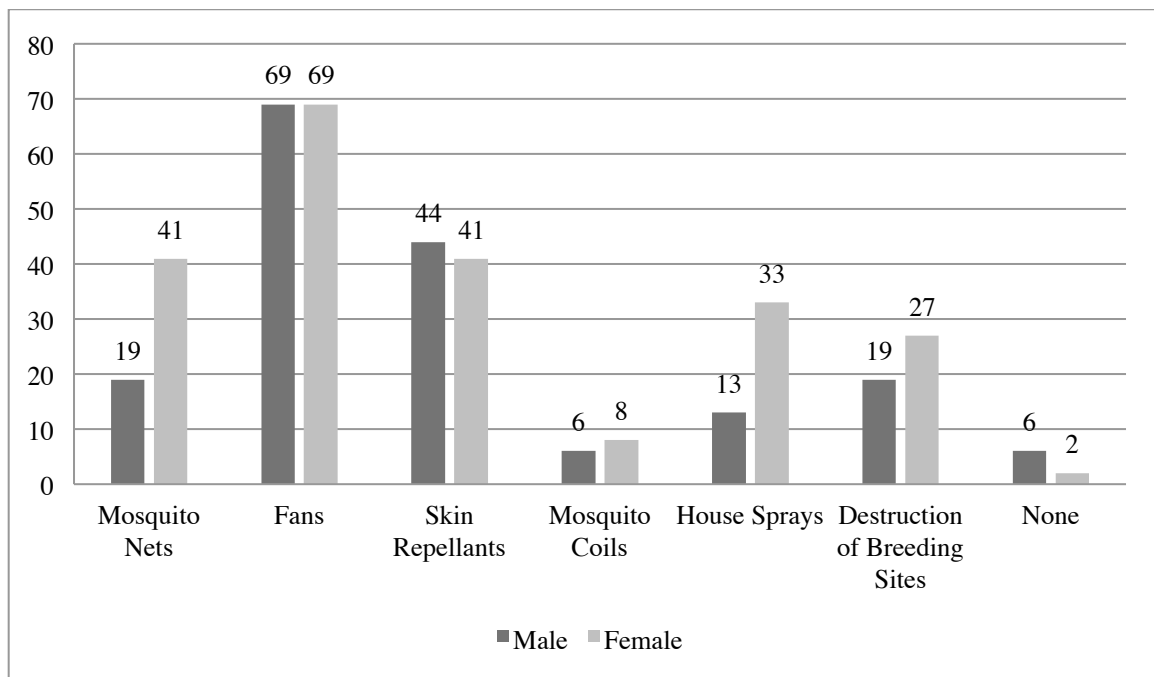


Figure 4.2 Percentage of Prevention Methods used by Chikungunya Survey Respondents Based on Respondent's Gender

Women were more than twice as likely to report using house sprays to avoid mosquito bites in comparison to men. Frequency of use of fans, skin repellants, destruction of breeding sites, and mosquito coils were relatively equal between genders. Skin repellents were the only method men reported using more frequently than women. Again, these results could be somewhat skewed by the smaller number of male respondents.

The frequency of use of prevention methods between survey sites (PUCMM and Juan XXIII) is shown in Figure 4.3. Overall, university respondents were more likely to

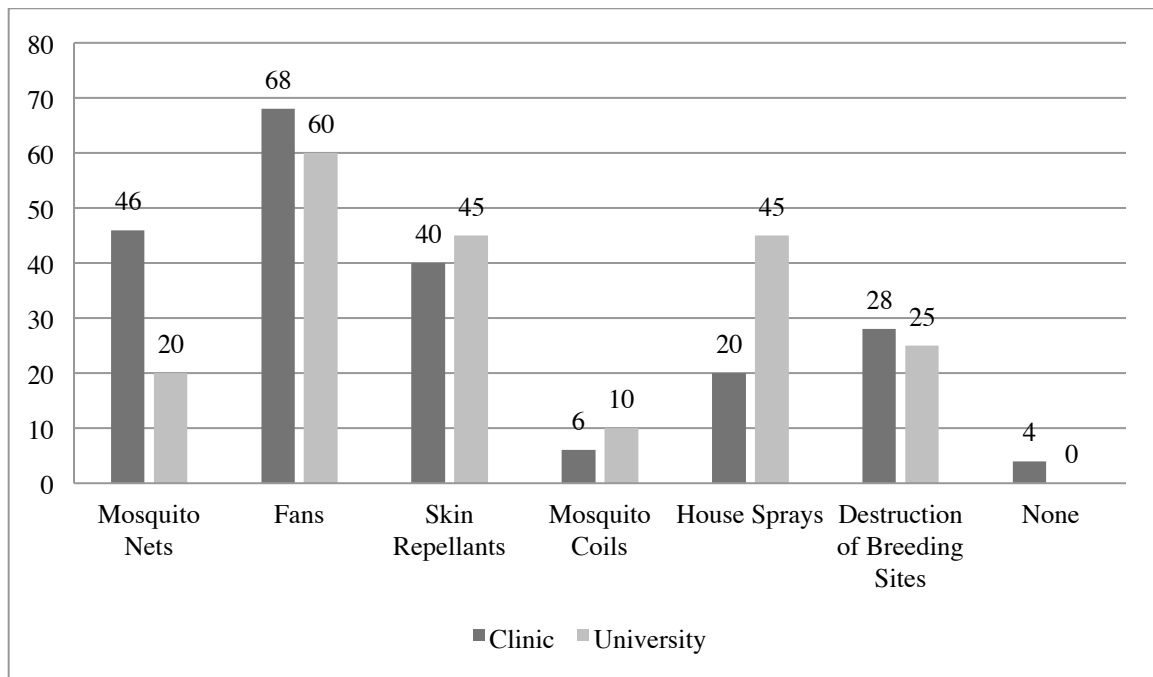


Figure 4.3 Percentage of Prevention Methods used by Chikungunya Survey Respondents Based on Survey Site

report use of skin repellants and mosquito coils, and also were twice as likely to report using house sprays compared to clinic respondents. The significant difference in this category warrants further investigation. In contrast, clinic participants were over twice as

likely to report using mosquito nets. As was common in all other demographic categories, both groups reported using fans at the highest rate.

4.5 Personal Concern Questions

The chikungunya survey had specific questions that asked the participant to rate their response on a scale of 0 to 10. These responses were then added together and averaged to get a single number representative of the answer given by all survey respondents. Figure 4.4 shows these averaged responses of all the participants to three

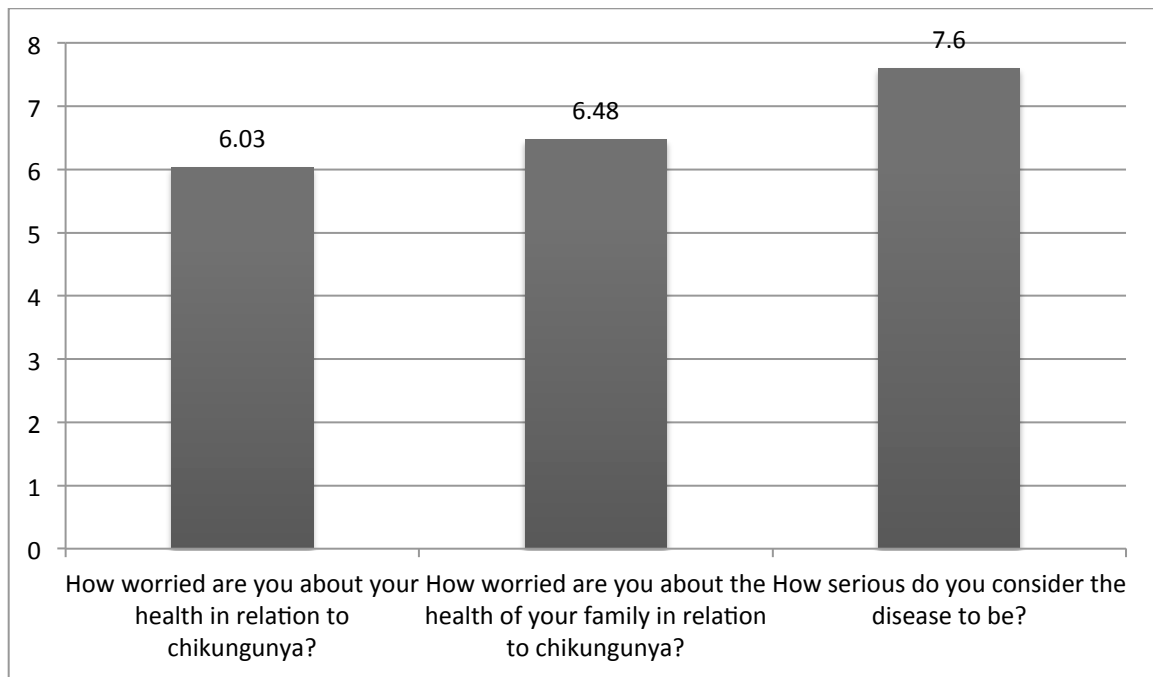


Figure 4.4 Averaged Chikungunya Survey Responses to Personal Concern Questions

of these questions. These three questions all consider the respondent's personal concern about their own health, the health of their family, and the severity of chikungunya. Two trends to notice here are the relatively high response individuals gave for how serious they consider the disease to be, a 7.6 out of 10, and also the consistently

higher values assigned to the concern for the health of an individuals' family rather than their own.

Figure 4.5 shows the average responses to personal concern questions by the different age groups. Individuals in the 40 and older age group had the lowest values in

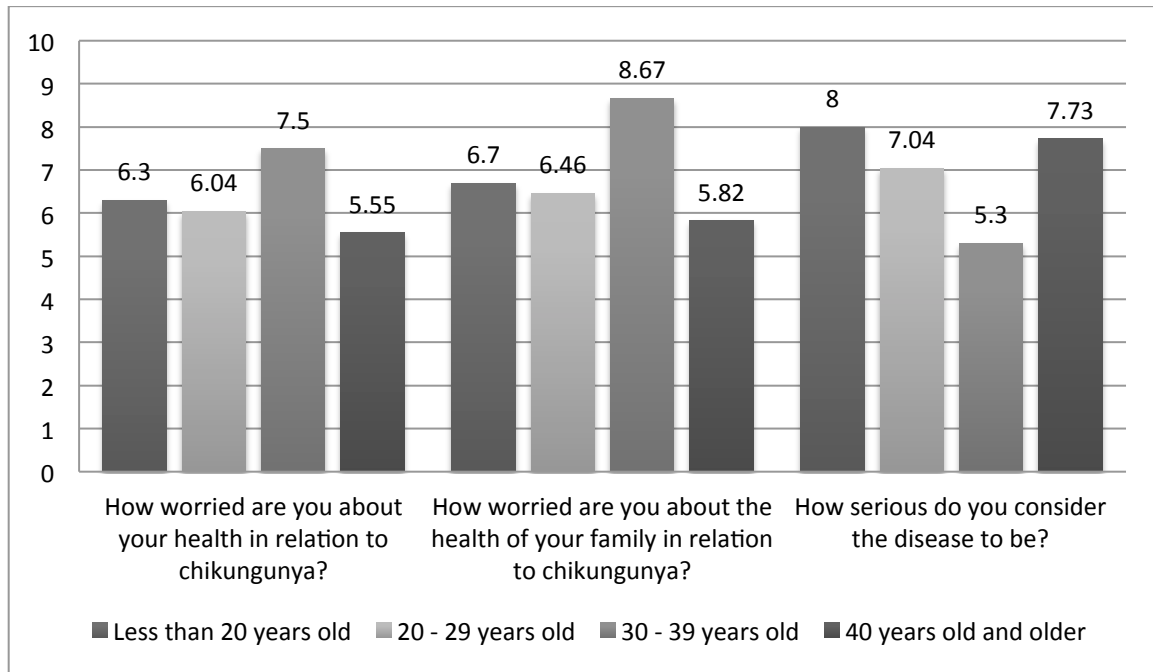


Figure 4.5 Averaged Chikungunya Survey Responses to Personal Concern Questions Based on Respondent's Age

relation to how worried they were for their own health and the health of their family, but had the second highest rating for how serious they consider the disease to be (7.3 out of 10). The disparity between rating of the seriousness of the disease and concern for the health of themselves and their family in the 40 years and older age group may be caused by confusion with the 0-10 scale. Overall, the group of individuals younger than 20 years old and the group 40 years and older considered the disease to be more serious than all other age groups; younger than 20 had the highest ratings for severity of chikungunya at

8 out of 10. The groups of individuals younger than 20 and between the ages of 20 and 29 has similar responses for their concern for their themselves and concern for their family in relation to CHIKV (within 0.26 of each other) but differed in their perception of the seriousness of the disease (0.96 difference). The 30 to 39 age group reported the lowest numbers for perceived seriousness of CHIKV of all demographic categories (including gender and survey site). Conversely, they also reported the highest rating for concern for their family members in relation to CHIKV. This might be because they are of the age where they have children but also living parents who could be susceptible to the disease.

Figure 4.6 shows the averaged survey responses to personal concern questions

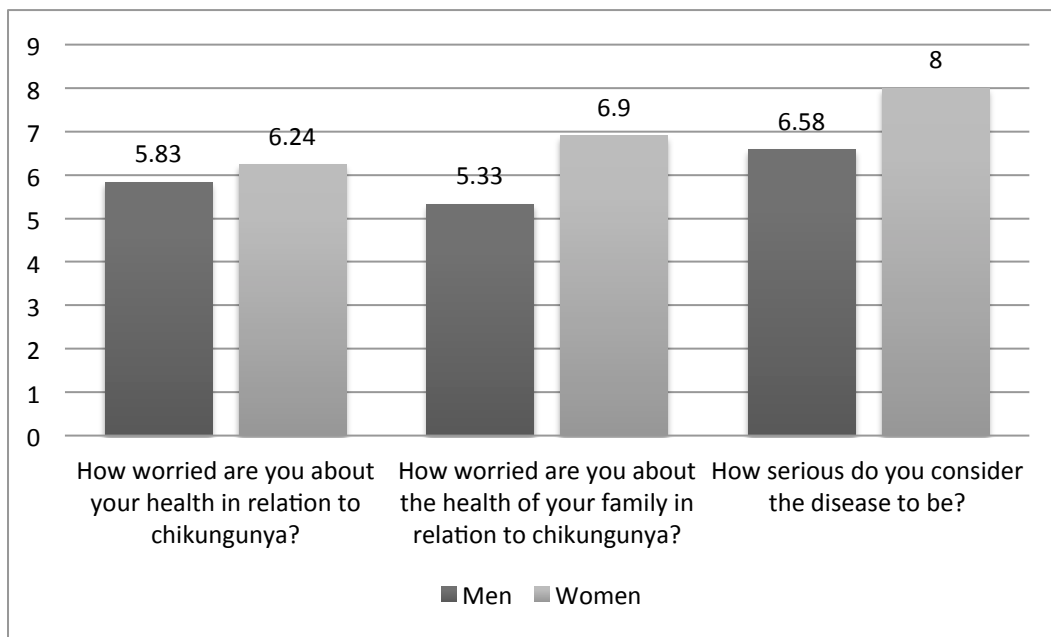


Figure 4.6 Averaged Chikungunya Survey Responses to Personal Concern Questions Based on Respondent's Gender

based on the respondents reported gender. There are a few trends here worth noting. First, women on average weighed their concern for the health of their family members at a 6.9,

which is significantly different from men who only reported their worry for family members health at a 5.33 out of 10. Women rated their perception of the severity of the disease highest out of all respondent demographic categories at an 8 out of 10, while men rated the severity a 6.58 out of 10. In contrast to all other demographic categories, males reported being more concerned about their own health than the health of their family. Men gave a rating of 5.83 in regard to concern for their own health and gave a rating of 5.33 in regard to concern for the health of their family members. This could be related to their lack of concern for the severity of CHIKV because the group might not attempt to protect family members if they don't consider the disease to be very serious.

Figure 4.7 shows the averaged survey responses to personal concern questions

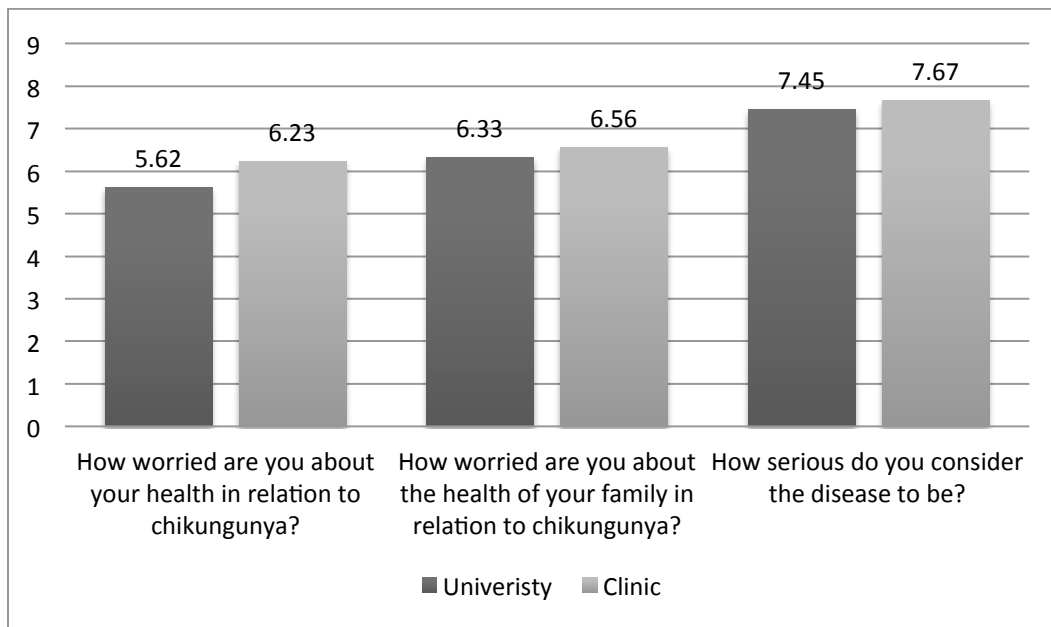


Figure 4.7 Averaged Chikungunya Survey Responses to Personal Concern Questions Based on Survey Site

based on location of survey distribution (PUCMM or Juan XXIII). As a whole both sites were more concerned with their families health than their own health in relation to CHIKV. There were also similar ratings for the seriousness of the disease between both groups (7.45 out of 10 for university respondents and 7.67 out of 10 for clinic respondents). Overall, there was a slightly greater concern for individual health and family health among clinic participants, as well as a higher rating for severity of the disease.

4.6 Behavioral Questions

Specific questions were asked on the chikungunya survey pertaining to the individuals behavior in terms of protecting themselves from mosquito bites before and after the arrival of CHIKV, protecting their family from mosquito bites, and also whether or not they believed it was even possible to protect yourself from them. Table 4.3 shows the total number and distribution (%) of survey responses concerning these behavioral

Table 4.3 Total Numbers and Distribution of Responses to Behavioral Questions of Chikungunya Survey

Question	Number	Distribution (%)
Before the arrival of Chikungunya did you protect yourself from mosquito bites?		
Agree	48	69
Disagree	21	30
No answer/ I don't know	1	1
Do you protect your children/family from mosquito bites?		
Agree	47	67
Disagree	20	29
No answer/ I don't know	3	4
Since the arrival of Chikungunya do you protect yourself from mosquito bites?		
Agree	60	86
Disagree	9	13
No answer/ I don't know	1	1
Do you think it's possible to protect yourself from Chikungunya?		
Agree	55	79
Disagree	6	9
No answer/ I don't know	9	12

questions. It should be noted that there was a 17% increase in self-reported protection from mosquito bites since the arrival of CHIKV (increased from 69% to 86%). This is likely due to fears of contracting CHIKV through mosquito bites after the arrival of the virus on the island. Additionally, 79% of respondents reported believing it was possible to protect yourself, but more participants responded that they were unsure it was possible (12%) rather than stating it was not possible (9%) to protect yourself. This may be a result of uncertainty about the transmission of the disease.

Table 4.4 shows the distribution of survey responses to behavioral questions

Table 4.4 Distribution of Responses to Behavioral Questions of Chikungunya Survey Based on Respondent's Age

Question	Respondent Distribution Based on Age (%)			
	Less than 20 years old	Between 20 and 29 years old	Between 30 and 39 years old	40 years old and up
Before the arrival of Chikungunya did you protect yourself from mosquito bites?				
Agree	60	60	67	92
Disagree	40	36	33	8
No answer/ I don't know	0	4	0	0
Do you protect your children/family from mosquito bites?				
Agree	55	56	78	100
Disagree	40	36	22	0
No answer/ I don't know	5	8	0	0
Since the arrival of Chikungunya do you protect yourself from mosquito bites?				
Agree	80	80	100	100
Disagree	20	16	0	0
No answer/ I don't know	0	4	0	0
Do you think it's possible to protect yourself from Chikungunya?				
Agree	85	76	77	83
Disagree	5	4	11	8
No answer/ I don't know	10	20	11	8

based on reported age. The percentage of respondents that reported protecting their family from mosquito bites increased with age (when divided into the four age groups), with respondents 40 years and older unanimously reporting that they protect their family members from mosquito bites in response to this question. The age group younger than

20 and group 40 years and older had the highest percentage of participants that claim it is possible to protect yourself against CHIKV,. These two age groups also rated the severity of CHIKV the highest (Figure 4.5) of all the age groups. The 30-39 age group had the highest percentage of individuals that reported it is not possible to protect yourself against CHIKV—which is in line with their responses shown in Figure 4.1 because they used most prevention methods less frequently than all other groups. The group of participants 40 years and older was the most likely to protect themselves against mosquito bites both before and after the arrival of CHIKV. This can also be related back to earlier responses showing that this age group used each type of prevention method more frequently than every other age group (Figure 4.1).

Table 4.5 shows the distribution of survey responses to behavioral question based on reported gender. There was as a significant difference in the percentage of each group

Table 4.5 Distribution of Responses to Behavioral Questions of Chikungunya Survey Based on Respondent's Gender

Question	Distribution of Men (%)	Distribution of Women (%)
Before the arrival of Chikungunya did you protect yourself from mosquito bites?		
Agree	63	71
Disagree	38	28
No answer/ I don't know	0	2
Do your protect your children/family from mosquito bites?		
Agree	38	75
Disagree	56	22
No answer/ I don't know	6	4
Since the arrival of Chikungunya do you protect yourself from mosquito bites?		
Agree	81	86
Disagree	19	12
No answer/ I don't know	0	2
Do you think it's possible to protect yourself from Chikungunya?		
Agree	75	78
Disagree	19	6
No answer/ I don't know	6	16

that reported protecting family members from CHIKV; 75% of women reported making efforts to protect their family from infection while only 38% of men said they did. There was an increase in use of protection methods in both men and women after the arrival of CHIKV. Women were more likely to report that they didn't know if it is possible to protect yourself (16% of women reported this compared to 6% of men). However, women were more likely to say they protect themselves and their family from bites, which is interesting to note in relation to Figure 4.2—this showed women were much more likely to use mosquito nets and house sprays (both of which protect family in a home). Of men surveyed, 19% reported that they believed it was not possible to protect yourself from mosquito bites. This could be a reason for the lower percentage of men that reported they protect themselves and their family from CHIKV. Men were overall the highest percentage category to report that it isn't possible to protect yourself from mosquito bites.

Table 4.6 (pg 97) shows the distribution of survey responses to behavioral questions based on location of survey completion. Overall, there was an increase in reports of the use of protection methods by both groups after the arrival of CHIKV. A significant difference existed in reports of protecting family members: 76% of clinic respondents reported protecting their family members, while only 48% of university respondents reported protecting their family members. This is especially interesting given that university respondents were the group with the highest reported rates of the belief that it is possible to protect yourself from CHIKV, yet less than half reported protecting their family. Both groups has high rate of use of skin repellants (Figure 4.3), which only protects the individual, not their family.

Table 4.6 Distribution of Responses to Behavioral Questions of Chikungunya Survey Based on Survey Site

Question	Distribution of Clinic Respondents (%)	Distribution of University Respondents (%)
Before the arrival of Chikungunya did you protect yourself from mosquito bites?		
Agree	69	67
Disagree	29	33
No answer/ I don't know	2	0
Do you protect your children/family from mosquito bites?		
Agree	76	48
Disagree	20	48
No answer/ I don't know	4	4
Since the arrival of Chikungunya do you protect yourself from mosquito bites?		
Agree	86	86
Disagree	12	14
No answer/ I don't know	2	0
Do you think it's possible to protect yourself from Chikungunya?		
Agree	71	91
Disagree	16	0
No answer/ I don't know	12	9

4.7 Societal/personal Perception Questions

Table 4.7 (pg 98) shows the total number and distribution of responses to societal/personal perception questions on the chikungunya survey. An area of significant consensus was in response to the statement “Mosquito control operations should be carried out regularly to protect people from tropical diseases” with 90% of respondents agreeing they should. It would be informative to find out why the remaining 10% disagreed. Table 4.7 also shows general discontent with the government: 57% of respondents didn't trust the official government estimates of the number of people infected and 71% of respondents believe that the government took too long to respond to CHIKV. Additionally, 39% of respondents believed the virus was intentionally introduced by outside agents and 11% of respondents believed the virus came to the DR from Haiti. There may be some overlap with these two categories (with respondents

Table 4.7 Total Numbers and Distribution of Responses to Societal/Personal Perception Questions of Chikungunya Survey

Question	Number	Distribution (%)
Chikungunya is transmitted solely through mosquito bites. Agree Disagree No answer/ I don't know	54 12 4	77 17 6
Chikungunya can be found in the air we breathe Agree Disagree No answer/ I don't know	14 50 6	20 71 9
Chikungunya can be transmitted through contact with a person who has the disease. Agree Disagree No answer/ I don't know	8 57 5	11 81 7
It is useless to protect yourself from Chikungunya. Agree Disagree No answer/ I don't know	16 48 6	23 69 9
Chikungunya can be avoided through personal protection methods. Agree Disagree No answer/ I don't know	48 15 7	69 21 10
Mosquito control operations should be carried out regularly to protect people from tropical diseases. Agree Disagree No answer/ I don't know	63 3 4	90 4 6
Official estimates of the number of Chikungunya sufferers and deaths can be trusted. Agree Disagree No answer/ I don't know	22 40 8	31 57 11
Public authorities waited too long before taking action against Chikungunya. Agree Disagree No answer/ I don't know	50 14 6	71 20 9
The worst of the Chikungunya epidemic is now behind us. Agree Disagree No answer/ I don't know	33 31 6	47 44 9
Chikungunya came to the Dominican Republic from Haiti. Agree Disagree No answer/ I don't know	8 56 6	11 80 9
The Chikungunya virus was intentionally introduced to the DR by outside agents. Agree Disagree No answer/ I don't know	27 35 8	39 50 11
The Chikungunya virus was introduced by travellers from places with Chikungunya. Agree Disagree No answer/ I don't know	36 28 6	51 40 9
Chikungunya has a cure. Agree Disagree No answer/ I don't know	45 17 8	64 24 11

thinking Haitians constitute outside agents). One of the most noticeable misconceptions in Table 4.7 is that CHIKV has a cure: 64% of respondents believed the virus has a cure. It would be interesting to investigate why these individuals believe it is not in distribution as it might be related to Dominicans overall distrust in the government.

Table 4.8 (pg 96) shows the distribution of responses to societal/personal perception questions about the chikungunya survey based on reported age. One important trend to note is that the percentage of respondents that agreed CHIKV was transmitted by mosquito bites was inversely proportional to reported age of the respondent. This is notable given the higher frequency of reported use of personal protection methods against CHIKV by the 40 years and older age group. The belief that CHIKV spread through personal contact also decreased as age increased, posing interesting questions about the beliefs that older age groups have about the methods of transmission of the disease. Of respondents 30-39 years old, 33% reported that it is useless to protect yourself from CHIKV; this may explain the fact that this group had the lowest reported use of personal protection methods. Those under 20 and between 20 and 29 years old were almost twice as likely to agree CHIKV was introduced to the island by outside agents. Determining which outside agents they believed to be responsible for the introduction of the virus to the island would help reveal the finer details of personal perceptions of the virus's origins. The 30-39 years old age group and 40 years and older age group were the least likely to agree there was a cure for CHIKV.

Table 4.9 (pg 100) shows the distribution of responses to societal/personal perception questions about CHIKV based on gender. Men were most likely of all the

Table 4.8 Distribution of Responses to Societal/Personal Perception Questions of Chikungunya Survey Based on Respondent's Age

Question	Respondent Distribution Based on Age (%)			
	Less than 20 years old	Between 20 and 29 years old	Between 30 and 39 years old	40 years old and up
Chikungunya is transmitted solely through mosquito bites.				
Agree	85	80	78	67
Disagree	10	20	0	25
No answer/ I don't know	5	0	22	8
Chikungunya can be found in the air we breathe				
Agree	20	16	22	25
Disagree	70	80	56	67
No answer/ I don't know	10	4	22	8
Chikungunya can be transmitted through contact with a person who has the disease.				
Agree	15	12	11	8
Disagree	75	88	67	83
No answer/ I don't know	10	0	22	8
It is useless to protect yourself from Chikungunya.				
Agree	10	16	33	17
Disagree	85	76	44	75
No answer/ I don't know	5	8	22	8
Chikungunya can be avoided through personal protection methods.				
Agree	75	84	44	42
Disagree	10	16	22	50
No answer/ I don't know	15	0	33	8
Mosquito control operations should be carried out regularly to protect people from tropical diseases.				
Agree	95	92	78	83
Disagree	0	8	0	8
No answer/ I don't know	5	0	22	8
Official estimates of the number of Chikungunya sufferers and deaths can be trusted.				
Agree	45	40	0	25
Disagree	45	56	56	67
No answer/ I don't know	10	4	44	8
Public authorities waited too long before taking action against Chikungunya.				
Agree	70	84	44	58
Disagree	25	12	22	33
No answer/ I don't know	5	4	33	8
The worst of the Chikungunya epidemic is now behind us.				
Agree	40	52	44	50
Disagree	55	40	33	42
No answer/ I don't know	5	8	22	8
Chikungunya came to the Dominican Republic from Haiti.				
Agree	10	16	0	17
Disagree	85	80	67	75
No answer/ I don't know	5	4	23	8
The Chikungunya virus was intentionally introduced to the DR by outside agents.				
Agree	40	44	22	25
Disagree	55	48	56	50
No answer/ I don't know	5	8	22	25
The Chikungunya virus was introduced by travelers from places with Chikungunya.				
Agree	50	64	22	33
Disagree	45	36	56	42
No answer/ I don't know	5	0	22	25
Chikungunya has a cure.				
Agree	70	72	56	58
Disagree	25	28	22	8
No answer/ I don't know	5	0	22	33

Table 4.9 Distribution of Responses to Societal/Personal Perception Questions of Chikungunya Survey Based on Respondent's Gender

Question	Distribution of Men (%)	Distribution of Women (%)
Chikungunya is transmitted solely through mosquito bites. Agree Disagree No answer/ I don't know	75 13 13	76 20 4
Chikungunya can be found in the air we breathe Agree Disagree No answer/ I don't know	6 75 19	24 71 6
Chikungunya can be transmitted through contact with a person who has the disease. Agree Disagree No answer/ I don't know	13 69 19	10 86 4
It is useless to protect yourself from Chikungunya. Agree Disagree No answer/ I don't know	13 75 13	25 67 8
Chikungunya can be avoided through personal protection methods. Agree Disagree No answer/ I don't know	75 6 19	71 22 8
Mosquito control operations should be carried out regularly to protect people from tropical diseases. Agree Disagree No answer/ I don't know	88 0 13	90 6 4
Official estimates of the number of Chikungunya sufferers and deaths can be trusted. Agree Disagree No answer/ I don't know	19 63 19	33 57 10
Public authorities waited too long before taking action against Chikungunya. Agree Disagree No answer/ I don't know	75 13 13	69 22 8
The worst of the Chikungunya epidemic is now behind us. Agree Disagree No answer/ I don't know	63 25 13	41 51 8
Chikungunya came to the Dominican Republic from Haiti. Agree Disagree No answer/ I don't know	6 81 13	14 78 8
The Chikungunya virus was intentionally introduced to the DR by outside agents. Agree Disagree No answer/ I don't know	38 50 13	37 53 10
The Chikungunya virus was introduced by travelers from places with Chikungunya. Agree Disagree No answer/ I don't know	69 19 13	45 49 6
Chikungunya has a cure. Agree Disagree No answer/ I don't know	75 13 13	67 25 8

demographics to not answer these questions and leave them blank. Women responded that CHIKV could be found in the air we breathe four times more frequently than men. The reason for this misconception is important to discover, as this kind of misconception may lead to more women to contract the disease because they do not consider it to be spread by mosquitos. Women were also more prone to trusting government estimates, with 33% of women reporting faith in the government estimates in comparison to 19% of men trusting government estimates. Responses between men and women in relation to whether or not CHIKV was introduced to the island by outside agents were extremely similar: 38% of men agree that CHIKV was intentionally introduced to the island and 37% of women also agreed with this belief. The response rates for disagreeing with this statement were also similar: 50% of men disagreed and 53% of women disagreed with the statement. This similarity in responses is not seen in most other questions on the survey. In contrast, nearly half of the female respondents disagreed that it was introduced by travelers from places with CHIKV, while only 19% of men disagreed with this statement.

Table 4.10 (pg 101) shows the distribution of responses to societal/personal perceptions questions on the chikungunya survey based on the location where they were distributed. One significant difference between clinic and university respondent's beliefs was in reference to whether or not the virus could be spread through the air: 27% of clinic respondents reported that the virus can be found in the air we breathe in comparison, only 5% of university respondents thought CHIKV could be found in the air we breathe. This difference may be due to differences in educational attainment or access to information. Another area of considerable difference between university and clinic respondents was in

Table 4.10 Distribution of Responses to Societal/Personal Perception Questions of Chikungunya Survey Based on Survey Site

Question	Distribution of Clinic Respondents (%)	Distribution of University Respondents (%)
Chikungunya is transmitted solely through mosquito bites. Agree Disagree No answer/ I don't know	69 22 8	95 5 0
Chikungunya can be found in the air we breathe Agree Disagree No answer/ I don't know	27 63 10	5 90 5
Chikungunya can be transmitted through contact with a person who has the disease. Agree Disagree No answer/ I don't know	12 80 8	10 86 5
It is useless to protect yourself from Chikungunya. Agree Disagree No answer/ I don't know	31 61 8	5 86 10
Chikungunya can be avoided through personal protection methods. Agree Disagree No answer/ I don't know	59 29 12	90 5 5
Mosquito control operations should be carried out regularly to protect people from tropical diseases. Agree Disagree No answer/ I don't know	88 4 8	95 5 0
Official estimates of the number of Chikungunya sufferers and deaths can be trusted. Agree Disagree No answer/ I don't know	33 55 12	29 62 10
Public authorities waited too long before taking action against Chikungunya. Agree Disagree No answer/ I don't know	67 20 12	81 19 0
The worst of the Chikungunya epidemic is now behind us. Agree Disagree No answer/ I don't know	51 41 8	38 52 10
Chikungunya came to the Dominican Republic from Haiti. Agree Disagree No answer/ I don't know	12 76 12	10 90 0
The Chikungunya virus was intentionally introduced to the DR by outside agents. Agree Disagree No answer/ I don't know	43 43 14	29 67 5
The Chikungunya virus was introduced by travelers from places with Chikungunya. Agree Disagree No answer/ I don't know	53 35 12	48 52 0
Chikungunya has a cure. Agree Disagree No answer/ I don't know	61 24 14	76 24 0

relation to whether CHIKV could be avoided through personal protection methods: 90% of university respondents thought CHIKV could be avoided through personal protection methods, while only 59% of clinic respondents agreed with this statement. Clinic respondents were evenly split on whether CHIKV was introduced to the DR by outside agents (43% in agreement and 43% in disagreement), while university respondents had more uneven opinions on this statement (29% in agreement and 67% in disagreement). In both locations similar numbers of respondents agreed that the virus was introduced from Haiti. Surprisingly, a higher percentage of university respondents, 76%, reported that CHIKV has a cure as compared to the 61% of clinic respondents that thought CHIKV had a cure. A possible reason for this result could be a misunderstanding about what the term “cure” means. Perhaps respondents thought that CHIKV having a cure meant that eventually symptoms would subside. This would only explain general misunderstandings, however, and not the difference between clinic and university responses in relation to this statement.

CHAPTER 5

DISCUSSION

Chikungunya is a mosquito-borne viral illness that has only recently entered the Western hemisphere. Soon after its appearance in St. Martin, it tore through the Caribbean and especially the Dominican Republic. There is no cure or vaccine for the disease, and the populations it encountered were immunologically naïve. The rapid spread of the virus combined with its very specific, persistent, and painful symptoms contributed to the creation of misconceptions about its origin and nature of transmission. The historical relationship the DR has had with the U.S. throughout the 20th century has shaped the nation's contemporary socioeconomic arrangements, and also played a part in determining the nature of the misconceptions about and prevalence CHIKV. Socioeconomic arrangements have also increased the vulnerability of large segments of the population to CHIKV and also shaped misconceptions about the disease.

5.1 Results

Data from surveys and interviews support this phenomenon. Only 77% of respondents agreed that CHIKV is transmitted solely through mosquito bites, and 20% of respondents agreed that CHIKV could be found in the air we breathe. A checkered political history, filled with foreign intervention on the part of the U.S. and the rise of a brutal dictatorship in the DR likely influenced many Dominicans to be doubtful of official government efforts to control the disease, as well as public messages about the

cause of the disease and methods to avoid it. 71% of respondents felt that public authorities waited too long to take action against the spread of the disease, and only 31% of respondents felt that official estimates of the numbers of individuals infected with CHIKV can be trusted. This same history of foreign political intervention contributed to suspicions that outside agents introduced CHIKV to the island. 39% of respondents felt that CHIKV was intentionally introduced to the island by outside agents. In a similar vein, the DR's violent history with Haiti and continued strained relations due to Haitian immigration led 11% of respondents to report that the virus came to the DR from Haiti. An informant mentioned this same belief during an interview as being an explanation that some Dominicans offer for the origin of the virus. Another reported belief about the origin of the disease was contamination in the Haina River, specifically mentioned by two interview respondents. Historically, the DR has lacked legislation protecting worker's rights, and recent trends toward neoliberal economic development have not helped fix this problem (Ferguson, 1992). The lack of labor rights is also accompanied by a lack of regulation; Bajos de Haina was severely contaminated with lead as early as the 1990's (Blacksmith Institute). It is unsurprising that some Dominicans might assume that a contaminant introduced to the Haina River was the cause of the outbreak. The fact that the first cases started in the province of San Cristobal further reinforce this idea, as the Haina River runs through the center of the province. Social and economic inequality have always been prevalent in the DR, and the deep class divisions that mark Dominican society are reflected in beliefs about the vulnerability of the poor not only to CHIKV but to disease in general. Every individual interviewed about CHIKV agreed not only that the poor were more likely to contract CHIKV, but also that they were more likely to have

more severe cases of the disease. A lack of nutrition and the inability to spend money on pain medicine or continuous hydration were commonly cited as obstacles for poor people suffering from CHIKV. In terms of probability of infection, living near standing water and ‘waste’ were both factors mentioned by informants that render those in poverty more vulnerable to CHIKV. It is true that these factors do in fact put an individual at a greater risk of both contracting and suffering from a more severe case of CHIKV (Meason & Paterson, 2014, p. 108). Although the poor are more vulnerable to infection, this socioeconomic division also contributed to 64% of respondents agreeing there was a cure for CHIKV. Statements taken from interviews conducted also support the idea that some Dominicans think that with enough money an individual can not only purchase relief from some of the symptoms of the disease, but also cure themselves of it.

Many of the misconceptions surrounding CHIKV in the DR have their roots in pre-existing historical processes and socioeconomic arrangements. Widespread misconceptions about the nature of a mosquito-borne infectious disease contribute to elevated rates of infection. Delineating the history of the DR and understanding the current state of the nation’s socioeconomic conditions and future development can help explain why some of these misconceptions exist, as well as highlight areas of public investment that can be reinvigorated for disease reduction (such as more regular trash pick up, or a more consistent supply of potable water). Some of the conditions that are conducive to the spread of CHIKV are ‘natural’ in nature: *Ae. aegypti*, the diseases transmission vector thrives in urban environments and standing water (Powell & Tabachnick, 2013). CHIKV has a 100% infection rate, meaning that if a mosquito that has taken a blood meal from an infected individual bites another person they will become

infected with the virus. This is a large factor in the virus's rapid spread across the island. The Dominican population had never been exposed to CHIKV and was immunologically naïve. All of these factors, directly related to the biological nature of the virus, contributed to the experience of CHIKV in the DR. It is also important to consider other non-biological factors that also contributed to conditions that were conducive to the rapid spread of CHIKV throughout the country.

The need to keep large containers of water near one's home is a definite contributing factor to the spread of CHIKV, as *Ae. aegypti* breeds in these reservoirs. A general lack of investment in public infrastructure is in part responsible for this practice. Instead of strengthening the infrastructure in ways that would benefit the majority of Dominicans, the government has continued a trend started under Balaguer to direct investment toward areas surrounding tourist resorts, in the hopes of both keep and attract new multinational corporations to the island (Cambeira, 1997). There is also a gross lack of investment in public healthcare, especially preventative healthcare and health education. A lack of tax revenue, caused in part by generous tax breaks offered to IFZ's and tourist resorts, has resulted in a dearth of funds that can be spent on public works projects (Pomeroy & Jacob, 2004). Compounding this problem is political corruption and cronyism. While Trujillo's reign over the DR did not entirely create these problems, his regime and the presidents that followed after him served to worsen the problem (Cambeira, 1997). Increasing rates of urbanization also put individuals in close proximity to one another in an environment ideal for the reproduction of *Ae aegypti*. This trend towards urbanization is a result of vanishing agricultural opportunities for Dominicans that have traditionally farmed the countryside. The economy is being further

damaged by the out-migration of large numbers of middle-class Dominicans to the U.S. in search of better opportunities outside of the service sector jobs that are proliferating in the DR as a result of paths in economic development that favor the creation of low-paying, high-turnover service sector jobs (Ancochea, 2005). Many of these processes and factors seem to be problems that hinder the economic development of the DR; in reality, these issues also contribute to the vulnerability of the population to mosquito-borne diseases like CHIKV. Global climate change and epidemiological patterns associated with the spread arthropod-borne diseases both suggest that tropical diseases of this nature will become more common in both the Caribbean and North America (Gratz, 1999, p. 51).

What can be done to help alleviate some of these problems that intensify the effects of epidemic events like CHIKV? Several informants pinpointed areas they felt the government could focus on to improve the health of the nation. A need for greater investment in healthcare was one of the most common refrains. More specifically, investment is needed not only in medication for helping an individual after they are suffering from a disorder but also in preventative healthcare and education. Mosquito-control operations should be undertaken throughout the year and more extensively, as other viral mosquito-borne diseases like Zika emerge and threaten to also spread in the region. Another potentially interesting idea proposed by an informant was the use of social media to spread awareness and information about the nature of common infectious diseases like CHIKV and how an individual can protect themselves and their family from infection. This would especially help prevent misconceptions about public health threats among younger individuals that might not trust government messages but who also spend

significant amounts of time on social media. In a broader sense, the DR would benefit from encouraging the growth of domestic sectors of their economy, rather than relying on and attempting to draw in multinational corporations with the promise of tax breaks and low labor costs (Ancochea, 2005, p. 710). While these decisions may seem beneficial in the short-term, middle-income countries will benefit most from long-term economic planning that capitalizes on human and material resources found within the nation's borders (Pinder, 2009, p. 230). The accelerating trend toward the adoption of neoliberal economic policies and models of development (such as the passage of the DR-CAFTA) serve to exploit low labor costs while not producing tax revenue that can be used for the benefit of the nation's citizens. While it may be unrealistic to think a nation would adopt new economic policies on the basis of threats from infectious disease, it is important to recognize that these structural processes play an important part in creating and maintaining conditions that are conducive to the rapid spread and profound impact of infectious diseases like CHIKV (Mowatt & Jackson, 2014). Economic ties between nations are also another determinant of the spread of a disease, with close economic partners being more likely to transfer pathogens to one another. Both the health and the economy of the U.S. and the DR are linked in this way.

5.2 Implications

Individual perceptions of a disease's causes are influenced by local social, cultural, and economic circumstances. Historical investigation into the processes that have led to the creation of particular social and economic structures provides context for the contemporary processes of meaning-making that occur when immunologically naïve populations are confronted with a highly infective and painful virus that is spread by a

vector already associated with other endemic diseases. The application of epidemiological investigation techniques that take more nuanced cultural and social factors into account would allow for more effective, individually tailored prevention and control programs. It is helpful to communicate to the public that mosquitos spread CHIKV, but these messages can be made even more effective if specific widespread misconceptions are specifically identified and refuted. Results from surveys on popular perceptions of a new infectious disease can be used to identify those demographics most and least likely to believe certain health messages or utilize particular protection methods (Setbon et al., 2008). This sort of critical investigation could potentially also be used to gauge the effectiveness of particular health messaging campaigns, such as the suggestion that social media be used to convey basic information about the nature of CHIKV. On a broader level, identifying and analyzing the impact of socioeconomic circumstances and historical processes can reveal structural weaknesses in a society that are conducive to the creation of vulnerability and misconceptions about a disease. Low-income levels, a lack of higher education, a fee-for-service health system, and general cuts in spending on water, health, and sanitation infrastructure are all contributing factors not only the nature and experience of CHIKV in the DR but also to the likelihood and impact of future mosquito-borne diseases that thrive in similar settings, such as Zika.

5.3 Suggestions for Future Research

The emergence and spread of new mosquito-borne diseases like Zika present a promising area for further research into social and behavioral responses to new mosquito-borne diseases in different nations and cultures. Another area of research that could greatly reduce the infection rates and impact of CHIKV and other mosquito-borne

diseases is the development of easily deployable, cheap, and widely available mosquito traps. In the absence of increased governmental mosquito control programs or investment in preventative healthcare and infrastructure, mosquito control will have to occur at the community level through the use of methods that are cheap, effective, and simple to understand. Methods like the sterile insect technique are also promising for decreasing mosquito populations, but must be state-sponsored due to the costs associated with the method (Wilke et al., 2009). Cross-cultural comparisons of popular perceptions of mosquito-borne infectious diseases like Zika and CHIKV would also be informative, providing information on the different social and economic formations that different region's historical experiences have created. These comparisons could also highlight major differences in perception and control that occur between developed and developing nations, and how disease control efforts could be more effectively deployed in both settings.

CHAPTER 6

CONCLUSION

CHIKV is a mosquito-borne virus recently introduced to the Western hemisphere. It spread rapidly throughout the Caribbean; especially affecting the DR where 429,421 cases were reported in the first six months after the disease was initially detected in February 2014 (Pimentel et al., 2014). No vaccine for CHIKV is currently available, though research is underway (Sudeep & Parashar, 2008, p. 447). The DR is a popular tourist destination for many American citizens. Effective control of this diseases within the DR can improve the quality of life for Dominicans and reduce the probability of the disease becoming endemic throughout the southeastern U.S. and other areas where the virus's vector is present, the *Ae. aegypti* mosquito.

Symptoms include fever, arthralgia, rash, nausea, headache, and diarrhea. In some cases the arthralgia can persist for months or years after the individual has recovered from active infection, significantly affecting quality of life and ability to work (Sudeep & Parashar, 2008). The manifestation of CHIKV in the DR does have its causes partially rooted in immediate environmental features of the country: patterns of rainfall, average annual temperatures, and the widespread presence of *Ae. aegypti* explain the ability of the disease to spread rapidly throughout the DR as well as other Caribbean nations. These same features also mean the disease could gain a permanent foothold in

nations with similar ecological conditions, including the southeastern U.S. and southern European nations such as Spain and Italy (Setbon et al., 2008). While these apparent features of the environment in the Caribbean and the DR explain the presence of CHIKV in a proximate sense, the examination of broader international processes, economic relations, politics in the DR, especially in relation to the U.S. can help explain why the disease has had such an impact in the DR. These same factors also influence the nature of misconceptions that have been generated about the disease which can affect the utilization of personal protection measures. Specifically, the asymmetrical relationship of power between the U.S. and the DR from the twentieth century onward have had a profound impact on the economy and development of the DR, and in turn the distribution and perception of CHIKV (Pons, 1995).

The implementation of an analysis that historically situates the problem at the macrolevel as well as gathering experiential and cultural information at the microlevel provides a comprehensive view of an issue that is shaped by both the local and the global, the past and the present (Brown & Barrett, 2010, p. 11). Health and disease must be understood as multidimensional phenomena that are affected by vectors, mutations, and environment as well as culture, history, and economics (Inhorn & Brown, 1990). Relationships of power and social inequalities can become more apparent and sometimes change or become more deeply entrenched during epidemics. As a result, reactions to widespread infectious disease can reflect pre-existing social and political structures and the process of meaning-making that occurs behind the disease (Ortner, 2006). Frequently blame for the presence of the disease is placed on socially marginalized groups, to the detriment of their health and often times the health of the general population (Briggs &

Mantini-Briggs, 2003). This tendency can often lead to shortcomings and misunderstandings in disease prevention efforts (Sherman, 2006). The third epidemiological transition is characterized by diseases like CHIKV, emerging or re-emerging infections that spread through the same global flows of capital, commerce, and migration that are accelerating as a result of globalization. At the same time, global warming has increased the range of environments conducive to the reproduction of arthropod vectors of disease and social and economic inequality continue to intensify worldwide. The socioeconomically disadvantaged are more likely to suffer from CHIKV, among a host of other infectious diseases (Meason & Paterson, 2014; Requena Mendez et al., 2014). These trends necessitate the application of theoretical frameworks that take into account the micro and macrosocial factors that impact the spread of disease and popular reactions to their presence.

The historical relationship between the DR and the U.S. in the 20th century played an important role in the creation of social and economic conditions that increased the vulnerability of the Dominican population to mosquito-borne disease and the likelihood that these diseases will eventually become endemic in the U.S. The 1916-1924 invasion of the DR had several consequences: communally owned lands were seized and consolidated to create sugar plantations under the control of foreign corporations or wealthy Dominican families, social inequality deepened, wealth became more concentrated, the rate of urbanization increased as a class of landless workers was created, and the Tariff Act of 1919 was passed (Calder, 1984). This legislation removed import duties on manufactured goods from the U.S., stifling industrialization and increasing the importation of foodstuffs. Urban environments are ideal for reproduction

of *Ae. aegypti*, impoverished individuals are more likely to become infected, and a lack of tax revenue leads to a concomitant lack of public spending on infrastructure, health, and education. The population was also disarmed and the Dominican military was dismantled and replaced with a National Police force trained in counter-insurgency tactics (Calder, 1984).

Rafael Trujillo worked his way through the ranks of this organization, eventually seizing control of the DR and using the National Police force as a violent extension of his will, kidnapping, murdering, and torturing any potential political opponents for over three decades (Pons, 1995). He disbanded all political parties except for the Dominican party, of which he was the undisputed leader. All government functions and the wealth of the nation became centralized in Trujillo's presidency, and his eventual assassination left the bureaucracy in disarray, rife with corruption and contested on all sides by vying political groups that had been suppressed for the past thirty plus years (Wiarda, 1968). The 1965 invasion of the DR was triggered by fears of communism and the election of a leftist president, Juan Bosch. U.S. troops invaded and assisted 'loyalist' forces in deposing Bosch who went into exile. In his stead, Joaquin Balaguer (a protégé of Trujillo) was installed, who continued to use similar tactics of political intimidation and assassination, while taking out massive loans from the U.S. and focusing on the growth of the Dominican economy through the creation of generous tax concessions for foreign corporations and the deterioration of worker's rights to lower labor costs (Ferguson, 1992). This massive political upheaval and corruption led many Dominicans to lose faith in their government. Balaguer also began to develop the tourism sector that would eventually become an extremely important part of the DR's economy and which would

also bring with it its own consequences for the physical and economic health of Dominican citizens. These historical events, many predicated on the actions of the U.S. government, directly influenced the nature of the contemporary socioeconomic environment in the DR. The social and economic dimensions of CHIKV are vitally important to its rapid spread throughout the DR.

Tourism, IFZ's, free trade agreements, and neoliberal spending policies are all factors that directly and indirectly increase the frequency of CHIKV in the DR. Tourism creates jobs for many Dominicans, but they are usually low-paying, devoid of any protection for workers, and have high rates of turnover. Additionally, public spending is diverted toward improving the water and sanitation infrastructure in and around tourist resorts rather than being used for the improvement of infrastructure in parts of the country that need it most (Ferguson, 1992). TNCs, the primary owners of tourist resorts in the DR, are also increasingly moving toward more verticalized and all-inclusive experiences. This decreases the number of locals hired to work at the resorts and discourages the purchase of local goods through restriction of tourists' movement outside of the resort. Tourism also increases the frequency of sexual tourism and prostitution, another risk factor for the spread of infectious disease and increases in interpersonal violence and social inequality. Many of these resorts utilize the nation's infrastructure without being required to pay taxes on any of their operations. This leads to a loss of tax revenue and an abundance of low-paying service sector jobs, as well as increased traffic to and from the DR and the U.S., harming the economy of the DR and increasing the risk of transmission of CHIKV from the DR to the U.S. A lack of public spending is a tenet of neoliberal development that has led the DR to cut spending on health, education, and

infrastructure as well as dramatically decreasing the number of public sector employees (Ancochea, 2005). The DR invests less in healthcare and education than many other nations in the Caribbean and Latin American regions (PAHO, 2012). Signing international free trade agreements like the DR-CAFTA serve to further weaken labor rights in the DR and expose Dominican markets to unequal competition with U.S. markets (Pinder, 2009). In a similar fashion, the creation of IFZ's in the DR further increase the reliance of the Dominican economy on the patronage of the U.S. and create low-paying jobs in crowded, dangerous conditions where workers produce consumer goods they frequently cannot afford themselves (Ferguson, 1992). This sort of development is only sustainable as long as the DR can offer TNCs the lowest labor costs for their product. Once another nation with lower labor costs becomes a viable site of production these corporations will uproot and shift their base of operations to those locations. The current trends in economic development in the DR are unsustainable, do not create proportional tax revenue for the DR to the profit they produce for TNCs, and further deepen social and economic inequality in the country (Pomery and Jacob, 2004). This trend in turn has led to the massive out-migration of the Dominican middle class to the U.S. where they seek better opportunities for themselves and their families (Bray, 1984). This pattern of migration has also made the Dominican economy extremely reliant on remittances from Dominicans in the U.S. Minor fluctuations in American markets are amplified and disproportionately affect the Dominican economy as a result. Poor water infrastructure and occasional blackouts necessitate the use of large water containers near individual households that serve as breeding grounds for *Ae. aegypti*. Irregular trash pick-up creates pools of standing water in garbage that also increase the

mosquito population. A lack of education and health spending means that many Dominicans are unaware of the benefits of destroying mosquito breeding sites, or the connection between CHIKV and mosquito bites. All of these factors are the result of a lack of tax revenue and intentional cuts in public spending that harm the health of Dominicans and make them more vulnerable not only to CHIKV but also to other emerging mosquito-borne diseases like Zika.

Misconceptions about CHIKV in the DR affect the implementation of public health campaigns and the utilization of personal protective measures. Public health messaging that stresses the role of *Ae. aegypti* in the transmission of the disease is helpful, but a historical mistrust of the government causes many Dominicans to be hesitant about believing these messages. The identification and analysis of specific misconceptions can allow for particular ideas to be explicitly refuted, like the rumor that CHIKV entered the country through contamination in the Haina river. These misconceptions, in turn, have their roots in particular historical relationships or events, like the massive lead contamination of the Bajos de Haina. Similarly, pre-existing prejudice toward Haitians influenced some respondents to attribute the origin of the disease to Haiti. Investigating the historical, political, and economic dimensions of health and disease in a specific yields more comprehensive understandings of the processes that contribute to the distribution, effect, purported origins, and perceived severity. This understanding, informed by both the nature of broad structural forces in society at the macrolevel as well as individual level perceptions of disease at the microlevel can help improve intervention and prevention efforts and avoid the further marginalization of already disadvantaged members of society.

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APPENDIX A – INFORMED CONSENT FOR EXEMPT RESEARCH

Dear _____,

My name is Preston Kerns. I am a graduate student in the anthropology department at the University of South Carolina. I am conducting a research study as part of the requirements of my degree in anthropology, and I would like to invite you to participate. This study is partially funded by the Walker Institute.

I am studying opinions about chikungunya in the Dominican Republic. If you decide to participate, you will be asked to complete a survey about your opinions concerning chikungunya, and if you are willing, meet with me for an interview about chikungunya. In particular, you will be asked about the cause, transmission, severity, and distribution of chikungunya. You may feel uncomfortable answering some of the questions. You do not have to answer any questions that you do not wish to. If you are willing to be interviewed, the session will be audio recorded so that I can accurately reflect on what is discussed. The tapes will only be reviewed by members of the research team (for transcription and analysis purposes). They will then be destroyed.

Participation is confidential. Study information will be kept in a secure location at the University of South Carolina. The results of the study may be published or presented at professional meetings, but your identity will not be revealed.

Taking part in the study is your decision. You do not have to be in this study if you do not want to. You may also quit being in the study at any time or decide not to answer any question you are not comfortable answering.

We will be happy to answer any questions you have about the study. You may contact me at phone number (843) 425-0899 or email kernsjp@email.sc.edu or my faculty advisor David Simmons at phone number (803) 348-1674 or email dsimmons@mailbox.sc.edu if you have study related questions or problems. If you have any questions about your rights as a research participant, you may contact the Office of Research Compliance at the University of South Carolina at 803-777-7095.

Thank you for your consideration. If you would like to participate, please fill out the survey or respond verbally to the questions contained within it. When you are done, please let me know.

With kind regards,

Preston Kerns

1003 Union Street, Columbia, SC 29201

(843) 425-0899

kernsjp@email.sc.edu

APPENDIX B – CHIKUNGUNYA INTERVIEW

1. Tienen sus pacientes / amigos / familia conceptos erróneos acerca de chikungunya?
 - a. Acerca de dónde viene?
 - b. Acerca de cómo se propaga?
 - c. Acerca de cómo se puede prevenir?
 - d. Acerca de la forma en que se puede tratar?
2. ¿Ha tratado casos de chikungunya?
 - a. ¿Conoces personalmente a alguien que ha contraído la enfermedad?
 - b. Cuál es el estimado de casos que ha tratado o que ha estado en contacto personalmente?
3. ¿Cree que los esfuerzos de prevención del gobierno son eficaces?
 - a. Por qué o por qué no?
4. ¿Cuáles son las medidas que piensan que el gobierno podría tomar para reducir las enfermedades transmitidas por mosquitos en general?
5. ¿Qué tan serio crees que es la chikungunya en comparación con otras enfermedades transmitidas por mosquitos?
 - a. Zika?
 - b. Dengue?
 - c. Malaria
6. Si una vacuna estuviera disponible para chikungunya, cree usted que sería muy utilizada por los dominicanos?

7. ¿Crees que la gente de escasos recursos tienen más probabilidades de contraer chikungunya?
8. ¿Crees que la gente de escasos recursos son más propensos a sufrir de casos graves de chikungunya?
9. ¿Ha tenido chikungunya?
- a. Si es así, ¿puede describir lo que era?
 - b. ¿Qué tratamientos usaste?
10. ¿Tiene usted conocimiento de cualquier otro tratamiento que la gente usa para ayudar con la prevención y el tratamiento de chikungunya?
11. ¿Hay algo más que quisiera mencionar sobre chikungunya o ideas de las personas en relacion a ella? ¿Qué pasa con otras enfermedades transmitidas por mosquitos?

APPENDIX C- CHIKUNGUNYA SURVEY

Edad: _____

Raza/Etnia: _____

Hombre/Mujer _____

Favor de valorar en una escala del 0 al 10

1. ¿Qué tan preocupado/a está sobre su salud respecto a la Chikungunya? _____
2. ¿Qué tan preocupado/a está sobre la salud de sus amigos y familiares en relación a la Chikungunya? _____
3. ¿Qué tan seria piensa usted que es ésta enfermedad? _____
4. ¿Antes de la llegada de la Chikungunya se protegía usted de las picadas de mosquitos? _____

Pregunta	Encierre en un círculo una respuesta por cada pregunta				
¿Antes de la llegada de la Chikungunya se protegía usted de las picaduras de mosquitos?	Si, muy a menudo	Si, algunas veces	No, raras veces	No, nunca	No lo se
¿Protege usted a su familia/hijos de las picaduras de mosquitos?	Si, muy a menudo	Si, algunas veces	No, raras veces	No, nunca	No lo se
¿Desde la llegada de la Chikungunya se protege usted de las picaduras de mosquitos?	Si, muy a menudo	Si, algunas veces	No, raras veces	No, nunca	No lo se
¿Cree usted que le sea posible protegerse de la Chikungunya?	Si, muy a menudo	Si, algunas veces	No, raras veces	No, nunca	No lo se

¿Cuáles métodos usted ha utilizado (o usa actualmente) para protegerse de las picaduras de mosquitos?

- a) Mosquiteros
- b) Abanicos
- c) Repelentes de mosquitos aplicados en la piel
- d) Espiral para mosquitos
- e) Insecticidas de rociador para la casa
- f) Destrucción de nidos de mosquitos

Marque la casilla con la que esté más de acuerdo.				
	Totalmente de acuerdo	De Acuerdo	En Desacuerdo	Totalmente en Desacuerdo
La Chikungunya sólo se transmite por las picaduras de mosquitos				
La Chikungunya se encuentra en el aire que respiramos				
La chikungunya se transmite a través del contacto con una persona que tenga la enfermedad				
Es inútil el protegerse de la Chikungunya				
La chikungunya se puede evitar a través de métodos de protección personal				
Operativos de control de mosquitos deberían llevarse a cabo regularmente para proteger a la población de enfermedades tropicales				
Los estimados oficiales del número de enfermos y muertos del chikungunya son confiables				
Las autoridades públicas esperaron mucho tiempo antes de actuar contra la Chikungunya				
Lo peor de la epidemia de la chikungunya ya quedó atrás				
La chikungunya llegó a República Dominicana desde Haití				
El virus de la Chikungunya fue introducida intencionalmente a R.D. por agentes externos				
La chikungunya fue introducida por viajeros de otros lugares con Chikungunya				
La chikungunya tiene cura				